The
Electrical Review

VOL. CXIII. JULY 28, 1933 No. 2905.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Principal Contents:

	PAGE
The Water-heating Load	109
A Consumer's Views on Tariffs. By W. B. Parker	112
Domestic Plugs and Sockets. By R. W. Willis	113
Oil-electric Locomotives. By Brian Reed	114
Case Hardening Steel. By John Dummelow	115
Some Cooker Improvements	118
New Water-heating Equipment	119
The Physical Society at Cambridge	120
The Lighting of the Masonic Peace Memorial	122
Correspondence: Earthing—Solid or Artificial?; Electric Light Flicker; Electricity in Fencing; The Reconstructed E.D.A.; The Cottages in the Strand; Large-scale Cooking at Manchester; Costing Bulk Supplies; The Grays of Silvertown; "Dobrulux" Lamps; The Specification for Electric Lamps; Electricity Gives Employment	123
New Apparatus and Devices	125
The Reorganisation of E.D.A.	127
"ERA" as a Trade Mark	128
Parliamentary News	129
Business and Industrial Notes	130
Electricity Supply	134
Traction	136
Communications	136
Contract Information	137
Notes	138
Our Personal Column	139
New Companies Registered	140
Returns of Electrical Companies	140
City Notes	141
Stocks and Shares	141
Published Specifications	143
New Work for Contractors	144

The Water-heating Load

PROGRESS in electric water heating is not being retarded by want of development in design and construction of the equipment, but it cannot be stated with confidence that all is well as regards tariffs. It is curious that the strong commercial case for better tariffs for water heating, as compared with cooking, for instance, does not appeal more strongly to the supply engineering mind.

Let us consider the more practical load-building points of view. Because the ELECTRICAL REVIEW has advocated strongly the elimination of many of the confusing classifications of the equipment available—free-entry, push-through, and what not—we are somewhat pleased to see in the revised recommendations just issued by E.D.A. a plea for the use of only four broad terms. We heartily congratulate the Water Heating Committee upon reaching in a comparatively short time a series of conclusions acceptable to all concerned; we do this, more particularly, in the light of experience in the cooking field.

Is the marked trend towards conversion schemes correct? No doubt, in many cases heat losses for the converted tanks are high, but we fail to see why such a tank cannot be properly lagged; there is certainly no case for inefficient conversion. We hope there will not be a water-heating "boiling plate controversy." Large quantities of water at low temperature *versus* smaller quantities at higher temperature makes for excellent academic reasoning, but the more practical considerations of cost, space available, the consumer's purse, and ease of installation should generally decide the question. Some of the undertakings which have made the most headway in water heating have done so almost entirely by conversion.

Is not hot-water wastage of more serious concern, however? We cannot concur with either of two ways suggested as a solution of this problem, namely, deliberately restricting hot-water consumption, and educating the consumer by way of a large initial quarterly bill. Direct and open propaganda is the only way. Is it sound to introduce the rectangular tank for non-pressure equipment while it is impracticable to do so for pressure equipment?

What of the geyser? It has a wretched load factor, but it is in some cases the direct answer to the method by which the gas industry has built up its water-heating load. There is an I.E.E. regulation deprecating the use of the bare element, while many thousands of geysers with such elements are on circuit. Obviously something wants sorting out. The argument *for* is speedy heat transmission; is there an effective argument *against*?

Undertakings will not seriously tackle water heating until they, in their appointments, recognise that it is a very specialised class of work. Correct installation is all-important, and placing a heater nearest the tap from which frequent small quantities of hot water are required may result in a large heat loss reduction.

Theoretically, night-load water heating is the ideal, but the practical difficulties of installing sufficiently large tanks sometimes debars this method for domestic work. Providing hot water as the medium for space heating, however, lends well to night loading, and it is one of the opportunities offered to the supply man for really large-scale load building when such big business comes to be seriously considered.

The E.D.A. Meeting

AT a largely attended meeting of members of the Electrical Development Association last Friday the reconstitution proposals were adopted. The resolutions are recorded elsewhere in this issue, along with a report of the discussion. The resolutions speak for themselves, and little comment on the speeches is called for. The subject has been forward so prominently and so long that the appeal for adjournment had little justification. Lord Ashfield, who presided, was more patient than many men would have been in such a position on a sweltering afternoon. The speeches of Mr. C. D. Taite, the chairman of the com-

mittee which has devoted so much time to the matter; Mr. R. P. Sloan, who has been a big E.D.A. supporter since its initiation and is also well able to visualise the future possibilities; Mr. Dunlop, who spoke for the manufacturers; and Mr. Robinson, who voiced the approval of the I.M.E.A.; and some others, were very much to the point. They were followed by an admirable reply, remarkable for its directness, clarity, and willingness to meet reasonable criticism, by Mr. H. C. Lamb, the Chairman of the E.D.A. Council. When the clouds of discussion had passed, he remarked that they were obviously agreed on principles, and only matters of detail remained. He was voicing the conviction of most of us when he showed that adjournment meant delay, which at this time of the year must inevitably defer anything in the nature of a national campaign until the 1934-1935 season. Before the concessions that he was able to announce on behalf of the Council in the Articles of Association was submitted opposition seemed to fall as the walls of Jericho.

The New Council and Officers

THE voting means that, as from September 21st, there will be a new Council of sixteen in office, including six nominated by the Central Board, five by the I.M.E.A., and two from the power companies. It should not be long before the names are known and the Council is able to proceed with such appointments as are considered necessary to enable new operations to begin. Only when the personnel of the Council and its officers is announced will there be an end to the rumours that have been current for several months. The sixteen will have power to co-opt not more than three persons, whether representatives of the members of the Association or not, as members of the Council, but without voting power. Representatives of the Area Committees will also be co-opted. A point of interest to all undertakers is the stipulation in the Articles that each member shall appoint as its representative a suitable member of its staff to receive all communications from the Association and to be responsible for carrying out its programme.

The Board's Contribution

DOUBT has frequently been expressed in recent months regarding the power of the Central Board to subscribe to the funds of E.D.A. for propaganda and publicity purposes. Some speakers raised the point again last Friday, including it among their reasons for delay, but the fact that the Board is itself an electricity supply authority under the Acts should silence all suggestion that it is going outside its special province in its efforts to stimulate the progress of the industry in whose interests it exists.

Committee "D"ead

IN 1927 Committee "D" was formed to consider a fair trading agreement proposed by the Scottish representatives in connection with Clause 48 of the 1926 Electricity (Supply) Act, which gave trading powers to authorised undertakers. Six years later, after many attempts to secure agreement, the wheel has gone full circle and the Committee has concluded its task, handing on to a further Committee now to be appointed proposals for a fair trading policy. This time, however, the electricity supply undertakings are not participating, which is rather like *Hamlet* without the Prince of Denmark, but with an extra large ghost hovering in the background. Mr. F. W. Purse, whose efforts to secure agreement among the conflicting interests have been very commendable indeed, thinks that when the other parties come to a working arrangement the supply authorities will be bound to fall into line, but we cannot imagine that anything short of a boycott would effect this, and we need not consider that as practical politics. The supply authorities are determined to supply apparatus on their own terms in order to ensure a market for their "juice," and they are just embarking, through the reconstituted E.D.A., upon intensified efforts to improve their loads; the wholesalers and contractors want to handle the appliances or, at least, ensure by price maintenance that the supply authorities shall not compete with them on unequal terms; and the manufacturers wish to do the right thing by both parties, but at the same time they want to sell their products. Six years' discussion has not brought matters anywhere near a real solution. Is there any hope of finding one by endeavours to reconcile interests which are so divergent?

Round or Flat?

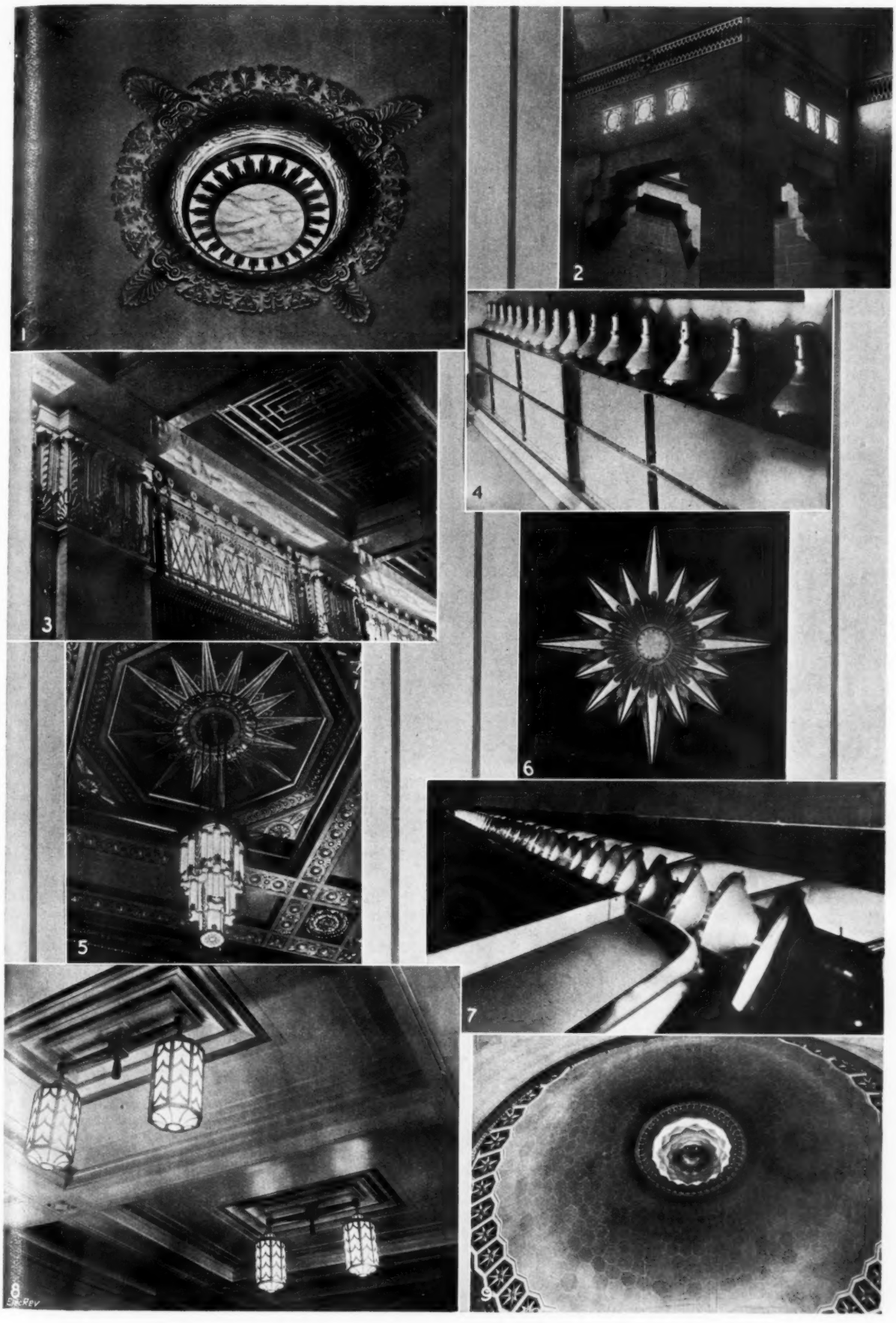
WE are not so concerned with Mr. R. W. Willis's attempt this week to prove the superiority of the flat-pin over the round-pin domestic plug and socket as with the retrograde step it would be to prohibit the use of the flat pin. There are whispers of attempts to make the existing Specification for plugs and sockets compulsory, and that would have the same effect, for the Specification is based on the round-pin design. Until one way of killing the cat can be proved the best way, what authority is there for excluding the other methods? Standardise by all means to avoid unnecessary confusion and waste, but do not let it arrest development in design, especially when such development must reflect on the ultimate objective of the industry—commercial success. We agree with the author that interchangeability in the consumer's house is more desirable than "universal" interchangeability, and if it be true that the degree of success so far attained in that respect has been brought about solely by virtue of the flat pin, then that alone is testimony in favour of that type of plug. But let both the round-pin and flat-pin advocates have a clear path.

Railway Electrification Hopes

ON very many occasions during the past year the Minister of Transport has been asked in the House of Commons what progress was being made with the schemes for the electrification of certain suburban railway systems. Each time the Minister has replied that all such schemes had been deferred pending the appointment of the Standing Joint Committee to be set up under the London Passenger Transport Act. That Committee has now been appointed. It consists of four members of the Transport Board and principal officers of the four railway groups, so we may expect that things will now begin to move after a long period of stagnation. The Liverpool Street lines should be the first to come under consideration, for here is a system which cries aloud for electrification.

Supply Staff Displacements

WE strongly urge the co-operation of all supply undertakings and the Central Electricity Board with the National Joint Board of Employers and Members of Staff in connection with the recommendations put forward for extending the use of the National Displacement Register. The Register is now to be used for anticipated displacements, and a simple workable scheme has been drawn up by which each district and the national secretary of the Joint Board will have a suitable file copy of the Register to which they can refer to fill vacancies of which undertakers have notified them. According to the report just issued by the Joint Board the existing Register, which concerns *actual* displacements only, contains only two names, and this is attributed either to the successful reabsorption of men in the affected districts or to there being few displacements. There is plenty of scope for reabsorption in the distribution side, and we believe that the Joint Board would have done well to stress this point in connection with the report in question.



The Lighting of the Masonic Peace Memorial (See page 122)

1. An ornate ceiling fitting. 2. Lunettes in one of the lodge rooms. 3. Illuminated window and onyx marble panels. 4. Down lights through a grid. 5. A pendant fitting in the second vestibule. 6. A sixteen-pointed illuminated star. 7. Ceiling projectors and cove trough in a cornice. 8. Wood lanterns in an ante-room. 9. An unusual view of a large dome fitting

A Consumer's Views on Tariffs. By W. B. Parker

SINCE an apology is undoubtedly necessary for adding to the large quantity of matter which has been written on the vexed question of tariffs, I would like to state at the outset that I would not have offended had it not been in the hope of viewing the subject principally from the standpoint of the consumer and of seeing how his requirements may best be met without forgetting the interests of the supply undertaking. After all, it is the consumer who has the final choice between electricity on any tariff and competing methods of obtaining the same service. Therefore it is far more important that tariffs should appeal to him than that they should conform closely to the total costs of giving the supply, which is an unattainable ideal to which no standard tariff can approximate.

The usual policy throughout the country seems to be the adoption of a two-part tariff, with alternative flat rates which are deliberately kept high, especially the heating rate, in order to encourage consumers to go over to the two-part tariff. It is my firm conviction that no policy could be adopted which would be more effective in hampering development. An example of this effect has just come to my notice. A visitor whose attention had been caught by a water-heater wanted to have one fitted. Inquiries showed that, although a two-part tariff with a kWh charge of ¼d. was advisable, the rateable value percentage exceeded the previous lighting bill by so much that a reasonable consumption for summer water-heating would have cost well over 1d. per kWh, thus rendering the proposition unattractive. Fortunately, in this case there was an alternative flat rate of ¾d. which saved the situation.

The Lighting Consumption Basis

It is often claimed that the fixed charge has a scientific basis in that it is related to the cost of getting ready to supply, while the kWh charge represents the actual generating costs, plus profit. To the consumer, who has no interest in such things, the fixed charge can never be anything else than an approximation to his previous bill for lighting. There is no function of the fixed charge which cannot be fulfilled by a primary block at the lighting rate, and a two-rate or multiple-rate tariff is far more likely to encourage development, since there is no formal change of tariff before adopting electricity for other purposes.

However, such a tariff by no means meets the needs of every type of consumer. There remains the numerous class of user, just exemplified, whose bill for lighting is much smaller than the fixed charge or primary block. This is liable to be the case where strict economy is necessary, or where a small family lives in a large house. If the flat rate is kept high the electrical industry is, in effect, refusing to supply this class of consumer at a competitive rate for other services. It is a strange anomaly that it is just the consumer who has to economise who is charged most if he adopts electricity for heating or cooking. Every reduction in the fixed charge, or primary block, brings a number of these consumers within reach of a competitive rate for other uses, but no amount of reduction of the secondary rate will attract them. At the same time the former type of reduction would represent a considerable loss of revenue in the form of an unnecessary concession to those consumers to whom it was already advantageous to be on the two-part tariff.

Mr. Parker writes purely as an ordinary consumer; he has no connection with the electrical industry

Standardisation an Obstacle

The present small consumer will never be persuaded to increase his consumption until the industry realises the folly of attempting to enforce any single standard tariff for domestic supply in an area where there is competition from gas. I would not for a moment suggest the abolition of all such tariffs, but, if unnecessary hampering of development is to be avoided, they must be supplemented by reasonable flat rates. The ultimate solution will probably lie in the sacrifice of the high charges for lighting. Then standard multiple-rate tariffs will be feasible with an initial rate of the order of 1d. However, the time will not be ripe for such a tariff until there is no such thing as a consumer for lighting only.

With regard to actual rates for domestic supply, I am of the opinion that, with the single exception of water-heating, it is not desirable to go below ¾d. per kWh at the present time. Lower rates will, of course, be necessary before the all-electric house can become general, but this stage can only be reached gradually. The best way to hasten development now is to offer apparatus and installations at the lowest possible rentals, looking to the increased sale of reasonably priced energy to make such a course economically sound.

Similarly, where the enclosed type of hotplate has been standardised every effort should be made to introduce special utensils without increasing rentals. Since the use of these utensils results in a reduced cooking consumption, the logical way of recovering their cost is by avoiding unnecessary reductions in the kWh price. Then the consumer pays the same amount for a lower consumption, thus obtaining greater satisfaction at no extra cost, and the undertaking receives the same revenue for a reduced supply with greater profit.

Reduction or Unification

What is needed far more than a general reduction in tariffs is a much greater unification of actual rates throughout the country. For this reason the growing tendency to reduce the kWh charge of domestic tariffs to below ½d. is to be deprecated as being premature and causing an even greater degree of divergence between districts. Similarly, very low rates for lighting are economically unsound and can only lead to unnecessary dissatisfaction in neighbouring districts where a reasonable rate is charged.

For water-heating ½d. per kWh would seem to be the ideal rate for development and reasonable profit, but, since it hardly seems worth while metering separately for this purpose for summer use only, it can be dealt with fairly satisfactorily by a reduction to this rate after a block at the standard rate in the two summer quarters. There is another system of supplying summer water-heating which has never been tried, but which would probably appeal to the consumer. This is a fixed-price contract system which could be applied in the form of an immersion-heater of low loading installed in the existing hot-water tank and left permanently in circuit unmetered during the period of contract, which could be any period of, say, from two to six consecutive summer months at the option of the consumer.

An additional element of about 1 kW in the same immersion-heater could be fitted with hand-control and connected to the meter to provide a boost and also to serve for occasional use outside the period of contract. At three kWh per penny, which would be profitable for this type of load, this service could be offered at ten shillings a month, based on the use of a 500-W element. Disconnection could be made by the simple removal of a fuse from a locked fuse-box and the system would only entail two visits per annum and would give a low rate without additional metering. For water-heating for use all the year round a good case can be made out for some method of disconnection at peak times with a rate not exceeding ½d.

The Heating Supply

It is not suggested that the reasonable alternative flat rates for other uses than lighting, which I consider necessary for the fullest possible development, should be allowed to apply to shop and office heating. In this case such a rate would probably be unprofitable, since the load is a winter one and undoubtedly overlaps the evening lighting peak. Many undertakings supplying domestic heating at ½d. are content with a flat rate of over 1d. for this load. Such a tariff is, of course, designed more to prevent an inconvenient demand than to encourage consumption, and the resulting high cost of electric heating is probably one of the principal reasons why the popular idea that electricity is expensive for other purposes than lighting is not dying so fast as it ought.

This heating load must be supplied off-peak, if it is to be fully developed, and this necessitates heat-storage. A simple semi-storage heater could easily be developed to replace the unhealthy, but extensively used, flueless gas radiator. Such a heater would have half its loading for direct heating and half for storage. Then, with three-heat control, immediate heat would be available with storage at all heats. These heaters could be cut off by a time-switch without inconvenience for two or three hours after sunset in the winter months and could be profitably supplied at a reduced rate. Since so many shops already have time-switches for late window-lighting, the use of a single time-switch with multiple contacts controlling both after-hour lighting and off-peak heating suggests itself. In addition, if these two loads could be supplied at the same price extra metering would be avoided.

In conclusion, I would like to endorse most heartily Mr. W. Lawson's statement in his I.M.E.A. paper (ELEC. REV., June 16th, p. 849) that a multiplicity of tariffs does not denote backwardness. On the contrary, it indicates a determination to miss no profitable business by attempting to enforce the minimum number of tariffs for general application.

Some Municipal Electrical Engineers

From left to right: Mr. C. Garfield Richards, Port Talbot, Glam.; Mr. E. W. Jones, Mountain Ash, Glam.; Mr. C. C. Wilde, Llandrindod Wells, Radnor; and Mr. Bertram Kelly, Douglas, Isle of Man

Domestic Plugs and Sockets. By R. W. Willis, M.I.E.E.*

A criticism of attempts to standardise round pins

EXCLUDING lighting equipment, domestic type plugs and sockets are to-day probably the most important and most used installation accessories, because of the ever increasing loadings of portable current-consuming appliances. Things are different from what they were in pre-war days when appliances were small and demands were not exacting.

The concentric-type plug and socket was at first much in vogue, but it was eventually rendered obsolete by the two-pin circular plug and socket which gave reasonable satisfaction in the days of lamp radiators, with their maximum 1,000-W rating, although, even then, overheating was often experienced.

Upon the introduction of the nichrome element there was a constant search for a satisfactory plug and socket. Changes of type were frequent in an endeavour to find a trouble-free model, and the British Standards Institution issued a Specification which unfortunately aimed at interchangeability rather than quality of contact. The Specification allows a possible 0.005-in. tolerance between pin and socket diameter, which is necessary because it is well-nigh impossible for a manufacturer to make a plug and socket of the circular-pin type much within that tolerance at the price at which he must produce it, although an allowance of 0.005 in. is detrimental to good contact.

Flat Pins the Solution

But why use a circular pin? Circles are only possible in theory; in practice they do not exist. Examination of a "circular" pin shows line contact only, a contact without pressure, and that is the explanation of overheating. The difficulty of getting good contact on circular pins is due to the necessity for multiple-point contact, whereas flat pins require only two-side contact, or even on one side only with spring pressure. It is apparent then that tolerance is easy to attain on flat pins, but very difficult on circular pins.

There is a movement to put pressure in the socket tube; if this pressure is obtained by throwing the socket out of axial alignment, then the consequent pitting of the pins will be a greater evil than the present one. Attempts at making the socket "springy" have been mostly unsuccessful because of the high-speed turning brass used. Metal used for mass production is necessarily soft and has no spring. A good illustration of this is the slotted brass pin whose members each side of the slot eventually take a set, with consequent reduction in the diameter of the pin and depreciation of the contact.

Evidence that flat pins offer the solution to the problem lies in the fact that such accessories as switches and fuses, with flat contacts carrying large currents do not overheat. There are already flat-pin plugs and sockets on the market, and those engineers who have used them testify that they overcome the troubles so common with circular pins.

B.S.I. Interchangeability

It is doubtful whether the interchangeability aimed at by the B.S.I. is a real necessity; certainly any such standardisation arrests progress in design. Rather should interchangeability in the consumer's house be aimed at. In any case, in the endeavour to secure interchangeability with three-pin plugs and sockets the earth contact is often sacrificed, and is slack and therefore of high resistance. Sacrificing good earth contact in these days of a.c. is a serious matter.

Another plug problem is multi-connection or interchangeability of plugs on one installation, independent of the size of the socket. Recently there have been put on the market adaptors with two or more ways, which are probably the best cable overloaders one could devise; no engineer would consider their use. It is certainly a great convenience to the consumer to be able to plug small appliances into the radiator socket, or into the radiator plug top, and such a system saves expense in wiring, facilitates the use of appliances, and materially helps the sale of electricity, thus rendering electricity an even more serious competitor with gas.

Fused Plugs are Necessary

The first solution of the problem is the fused plug top, and authoritative tests should show that it conforms to Rule 68 D (I.E.E. Wiring Rules, 1927) to ensure safety. Probably the rules should be amplified to exclude open-type fuses which, if packed with asbestos, might satisfy the tests. But often when the layman replaces the fuse the asbestos is left out, making the fuse vulnerable. There is much to be said for the plug head with cartridge fuses.

It is important that the 5-A fused plug should be usable with the 15-A socket, and therein lies the difficulty. To wire all sockets for 15 A would be too expensive. One manufacturer has overcome the difficulty by making two sockets, a 15-A one, which takes either a 15-A plug or a 5-A fused plug, and a small capacity socket which takes the fused plug, but not the 15-A plug. Further, the 15-A plug top has accommodation for the 5-A fused plug, so that a radiator and a small appliance can be used at the same time. This ingenious arrangement has been made possible by using flat pins. Contact is only dependent upon the thickness of the flat pin, and not the width, so that provided the thickness of the pin is retained on each of the plugs and the width only altered, entry of the larger plug in the smaller socket is prohibited, whilst the narrower pin of the smaller plug will fit the larger socket.

An installation with such a system of plugs offers rational interchangeability and something which is very attractive. No longer need a consumer when buying an appliance be concerned as to whether it can be connected. If its loading is over 1 kW a larger plug would be fixed to the flexible cable, and if under 1 kW a fused plug would be supplied and the consumer could use it anywhere with adequate protection.

The first move by the B.S.I. should be to abandon Specification No. 372, which was wrong at the outset—to try to improve it would be to court further failure. Opinions of engineers are strongly in favour of flat pins, and the Specification should provide for these, bearing in mind that flat pins and their sockets should not be pressed, but of solid metal.

It is my opinion, however, that standards for plugs and sockets are best left alone. We are by no means near finality with regard to the wants of the consumer. The grid has to be loaded, and plugs and sockets are too important a connecting device to assume that finality in design has been reached. We want all the ingenuity of the manufacturer, the supply engineer and others interested and standardisation would choke that ingenuity.

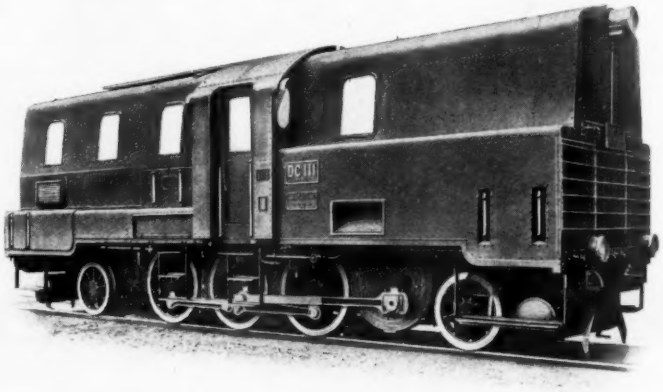
*Engineer and manager, Cheadle & Gatley U.D.C. Electricity Department.

Oil-electric Locomotives. By Brian Reed

A comparison of some recent examples

A SPECIFIC advantage of oil-electric locomotives is the ease with which a vehicle may be converted from a passenger to a slow-speed goods unit and *vice versa*, excluding, of course, the type in which tramway motors drive the axles. For the latest Buenos Aires Great Southern Railway main-line oil-electric locomotives two sets of gears are being supplied, the larger gear ratio giving a maximum tractive effort fifty per cent. greater than that of the most powerful steam locomotive on the same railway, in spite of the fact that the total weight is ten per cent. less at 148 tons.

High tractive effort at low speed can be obtained from a small engine, but it needs plenty of weight to give a reasonable factor of adhesion. Higher speeds than those shown in the curves are possible, but there is no 600-b.h.p. oil-electric passenger locomotive in existence, although one or two rail-cars in the U.S.A. have prime-movers of this size, and run up to 70 m.p.h. All the 600-b.h.p. curves hang together over the middle range, but the very high starting efforts are only obtained at the expense of reduced maximum speed. Four motors are necessary to produce the "peak" initial efforts of curves A and B, where the great adhesion weight is utilised to the full. It is only on exceptionally heavy locomotives that four motors can be grouped in series, for the high starting torque which even a small series motor will provide would occasion slipping at the start. Locomotive A, the heaviest machine included in the curves, starts only in series-parallel, yet it has a very low factor of adhesion.



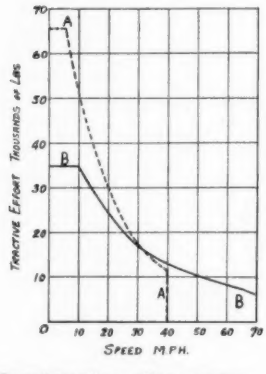
A 600-h.p. oil-electric locomotive on a Japanese railway

The two rod-drive machines hold on to their maximum values to higher speeds, and example C, which is used on local goods trains as well as in yard work, has an appreciably higher speed than the others. From 22 m.p.h. the double-armature motor is working with reduced field, but in the case of locomotive A the field is weakened to 65 per cent. from 18 m.p.h., the four motors being grouped in full parallel from 5 m.p.h. The factors of adhesion of locomotives C and D are typical of the values favoured by Continental builders, despite the lesser likelihood of slipping than with nose-suspended motors. American practice keeps logically enough to true electric locomotive figures, *i.e.*, well below 4, while the few examples of British practice lie between the two extremes.

A great extension of the power range can be obtained in electrified areas by arranging for an oil-electric locomotive to collect current from a third rail or overhead line. A large storage battery may be incorporated, and the oil-engine output boosted from this internal supply, or the battery current used alone, as operating conditions may require. The New York Central lines have over forty of such units. The rated horsepower of the engine is 300, but additional capacity up to a limit of 720 h.p. for one hour, or 1,000 h.p. for a few minutes, can be obtained by drawing from the 680-Ah battery. When working on "external" power the capacity is 1,600 h.p. In operation the generator delivers power to the traction motors and to the battery, without overloading the engine, and returns automatically to charging the battery as soon as the load is discontinued. The external supply in this case is 600 V d.c., but the Delaware, Lackawanna, and Western R.R. has some similar units designed to work from 3,000 V d.c.

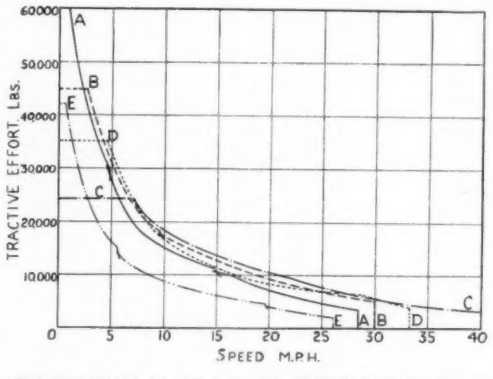
Much of the weight of oil-electric locomotives is due to the transmission (electric) equipment, which usually ranges from 60 to 85 lb. per b.h.p.; in one case this has been reduced to 48 lb. per b.h.p. Nose-suspended motors are largely responsible for this state of affairs, especially when a large tractive effort per motor is required. Forced-ventilated traction motors of large size for electric locomotives now average 22 to 23 lb. per h.p. on the hourly rating, but the average weight in recent oil-electric machines is approximately 27 lb. per b.h.p. Although one or two motors are operated at 750 V, the majority of those used in oil-electric work have a maximum of 600 V.

Rod-drive machines enable an appreciable saving to be made in both weight and first cost. In fact, compared with such an arrangement, the Diesel-mechanical locomotive can show no advantage in the matter of weight, and very little in the cost, so there is obviously a future for this type of locomotive, particularly as it imposes less stress on the track and is safe at any speed.



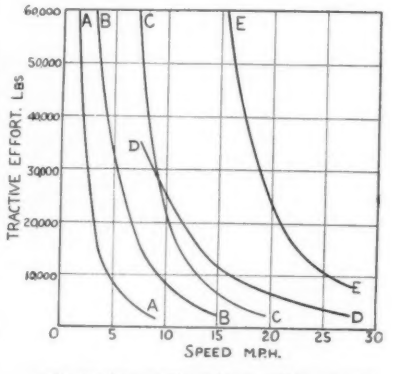
Speed-tractive effort curves for 1,700 h.p. locomotive (B.A.G.S. Railway)

AA. freight, BB. passenger



Characteristics of some recent oil-electric locomotives

AA. 600-h.p. 4 motors, BB. 600-h.p. 4 motors, CC. 600-h.p. 1 double-motor drive, DD. 600-h.p. 1 single-motor drive, EE. 300-h.p. 4 motors



Oil-electric battery locomotive curves

AA. series (internal power), BB. series-parallel (internal power), CC. series-parallel (external power), DD. parallel (internal power), EE. parallel (external power)

A New Mercury Switch

A MERCURY switch which is refractory protected so as to confine the arc and to obtain long life with dependability has been announced by the Westinghouse Electric & Manufacturing Company. Made with nominal ratings from 3 to 50 A, it comprises a new line of single-pole, single-throw switches. The contact is made by an impact between two pools of mercury within a refractory chamber encased in heavy glass walls. Instead of flowing slowly together, the mercury from one pool drops to meet the other with a sudden visible "jump." An atmosphere of inert gas within the chamber keeps the mercury chemically pure and dissipates the heat.—*Electrical World*

Case Hardening Steel

Modern electrical methods

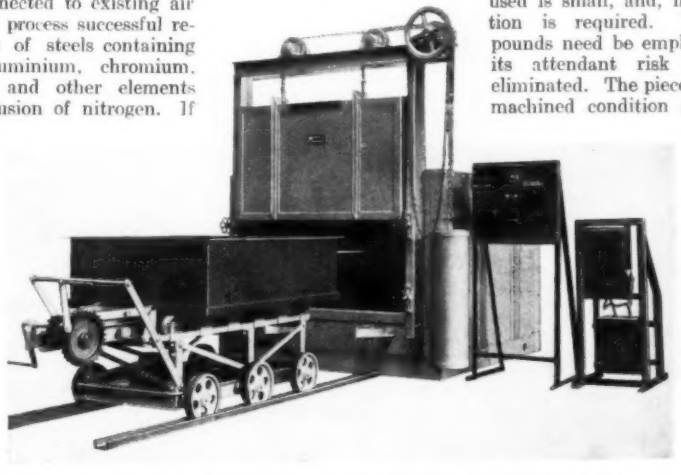
By JOHN DUMMELOW, M.A.(Cantab.)

THE carburising or case-hardening process is one of the best known methods of obtaining a hard wearing surface on steel parts subject to friction wear. In its ordinary form the extra carbon is introduced into the surface of the steel pieces by heating them at 870-950 deg. C. in boxes surrounded by and in close contact with a case-hardening compound; subsequent heat treatment is generally necessary.

This process is well suited to many present-day requirements, but for use with small parts two important developments have been introduced recently in order to obtain a case-hardened surface without distortion, without producing soft spots (which may be caused by careless packing in the box carburising method) and without liability to peeling or spalling. These developments are cyanide hardening, in which the pieces are heated in an atmosphere of cyanogen (a chemical compound of carbon and nitrogen), and nitriding, in which they are exposed to the action of anhydrous ammonia gas. Either method minimises distortion and ensures that there is no sudden transition from case to core, the hardness being at a maximum just below the surface and falling off gradually towards the centre, whereas previously the line of demarcation was definite. Temperature variations cause uneven depth of case, exfoliation on grinding, and other troubles. It is only by means of an electric furnace, with its facilities for automatic temperature control, that good results can be obtained without skilled labour and attention.

Cyanide and Nitriding Processes

For cyanide hardening the steel pieces are heated in a bath of molten salts, such as sodium cyanide and potassium cyanide. The electrical input must be accurately adjusted to maintain the salts at the hardening temperature of 900 to 950 deg. C. and to take care of the varying heat absorption of the pieces, which depends on their weight; automatically controlled electric furnaces give a more consistent treatment than any other type of salt-bath furnace working under ordinary commercial conditions. Ventilation can be provided through hoods, which may be connected to existing air systems. In the nitriding process successful results depend on the use of steels containing small percentages of aluminium, chromium, molybdenum, vanadium, and other elements that help the correct diffusion of nitrogen. If ordinary carbon steels are nitrided the nitrogen penetrates the core, giving a product that is not only very little harder but is also much more brittle. It is therefore necessary to use special alloy steels ("nitralloy") and cast iron ("nitri-cast-iron") in which normal variations of the carbon content according to the mechanical properties required in the core have no effect on the hardness of the case produced. The following notes explain the method of procedure and an example of a nitriding furnace is illustrated.

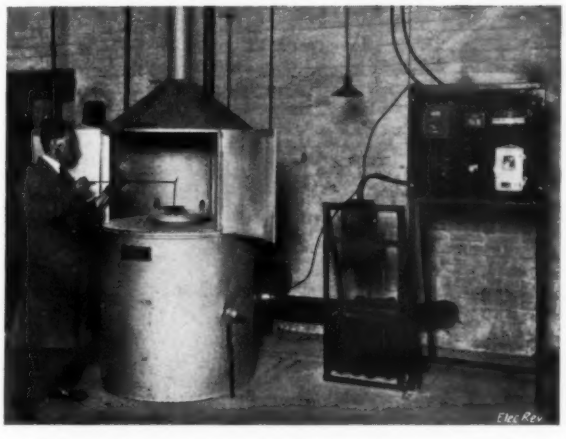


An electric nitriding furnace with automatic temperature panel

Hardness at High Temperatures

These steels are subjected to the ammonia action for periods ranging from twenty to ninety-six hours (according to the depth of case required) at a temperature of about 500 deg. C.; at this temperature the ammonia is dissociated, and the nascent nitrogen is diffused into the outer layers of the steel, combining with the alloying elements to form nitrides. A much harder surface than can be obtained by case-carburising is thus formed and is combined with high resistance to wear, abrasion, and corrosion. Nitrided steel has a Brinell hardness of from 900 to 1,100 and will cut glass and quartz; the hardness is maintained up to a temperature of 500 deg. C. (thus preventing "seizing" of badly lubricated shafts that have been nitrided)—other steels cemented and quenched begin to soften at 180 to 200 deg. C.—and even after softening at higher temperatures most of the hardness is regained during cooling.

The resistance to wear is ten times that obtained by the older methods; wear on cylinder liners, pistons, and rings on



An electric cyanide hardening furnace

automobile and aeroplane engines is negligible after 30,000 miles running, and piston speeds can be raised by 400 r.p.m. The additional advantage of resistance to corrosive action is of great importance in the manufacture of pump shafts that are to be in contact with salt water, ordinary cooling waters used in automobiles, moist atmospheres, or i.c. engine gases where the iron oxide picked up by the cooling liquid passing through the water jackets acts as a grinding wheel on the shafts.

It should be emphasised that while producing a case of these exceptional qualities nitriding leaves the physical characteristics of the core unimpaired, and the low temperature of the process combined with the previous heat treatment ensures that there is no distortion or warping, no internal stresses or strains are set up, and the case is in perfect union with the core. Intricate designs such as worms where the difficulties of final rectification after quenching prevent cementation by any other method can thus be nitrided with ease. Running costs are low, little electricity is consumed owing to the low temperature of the process, the amount of ammonia gas used is small, and, moreover, minimum attention is required. No case-hardening compounds need be employed, and quenching with its attendant risk of hardening cracks is eliminated. The pieces are nitrided in the finish-machined condition and are ready for use as soon as the process is completed, further heat treatment being unnecessary.

For successful nitriding it is essential to obtain uniform heat distribution, constant temperature (for variations that would be considered small in fuel-fired furnaces have an appreciable influence on the rate of dissociation of the ammonia, a comparatively small increase in temperature reducing the hardness of the case considerably), controlled dissociation of ammonia to give a constant flow, and uniform distribution of the gas over the surfaces of the pieces. It is also necessary to prevent decarbonisation, and the equipment must avoid the use of any material liable to dissociate ammonia by catalysis.

The Nature of the Equipment

Suitable equipment consists of an electric furnace provided with automatic temperature control, a gas-tight box with loading bogies, an ammonia vessel with control valve, and the necessary tubes and simple apparatus for determining the extent of the dissociation of ammonia. The furnaces are made in two types, the usual horizontal box or batch type (fitted with special roller hearth) and the vertical cylindrical type; the use of fixed furnaces with suitable charging bogies is necessary for the highest thermal efficiency and the lowest operating costs.

Withdrawable elements should be fitted, and an automatic temperature control panel should also be provided. Dual-purpose furnaces with interchangeable hearths, which are suitable for case-carburising, annealing, hardening, and general heat treatment work as well as nitriding, are also used. The

gas-tight box must be capable of withstanding the action of ammonia gas at nitriding temperatures and must prevent any catalytic effect. It may be made of special alloy sheet or of vitreous enamel; an alloy steel construction is preferable for standing up to rough usage as enamel is liable to chip. Inlet and outlet tubes are fitted for the circulation of ammonia gas, and various methods of sealing are available according to size and other characteristics. The ammonia is supplied direct from cylinders and discharges through a water bottle giving about ½ in. back pressure; it is sometimes advisable to mount a fan in the box to ensure uniform gas distribution.

Nitriding is carried out by placing the pieces loosely without any packing material in the gas-tight box, the layers being separated by nickel wire netting to allow the gas to circulate freely; any portion, such as threads and keyways, that must be kept soft can be previously tinned or otherwise protected against the action of the ammonia gas. The box is charged into the furnace and brought to the nitriding temperature, at which it is held within +or −5 deg. C., a constant flow of ammonia being maintained. After a sufficient time has elapsed to produce the required depth of case (from about 20 hours for 0.2 mm. depth to 96 hours for 0.8 mm. depth) the furnace is allowed to cool down quickly to 370 deg. C., when the box is taken out. The steel pieces are ready for use when cool enough to handle; the very thin grey film on the surface can be easily removed, if desired, by butting or lapping. In machining delicate parts allowance must be made for a slight but uniform swelling (about 0.001 in. on diameter during nitriding. The furnaces illustrated were manufactured by the General Electric Co., Ltd.

Electrically Operated Mobile Cranes

Three methods of control

IN the design of the operating equipment for modern electric mobile cranes, particular attention has been paid to ease and simplicity of control which is naturally dependent largely on the service to which the crane will be applied. Methods of control may be placed in three categories: (*a*) plain rheostatic control; (*b*) throttle control; and (*c*) a combination of both.

The equipment for a crane with ordinary rheostatic control comprises a constant-speed generator driven by a Diesel or petrol engine and delivering a constant d.c. voltage to the motors for the different motions, the speeds of the latter being controlled by reversing drum controllers and series resistances.

A six-ton caterpillar mobile crane (rheostatic throttle control) and (right) a plan view of a similar crane with series-throttle control

A crane operating on throttle control is equipped with a generator, the speed of which is controlled by a foot pedal acting on its engine accelerator. Each motor is provided with a drum-type reversing switch and is switched directly across the generator with the engine just ticking over, the motor speed being adjusted as the generator voltage is varied with the engine speed.

The generator operates as a plain self-excited machine, but the poles have slots cut in them so as to form a highly saturated portion of the magnetic circuit. The maximum current can be arranged to occur at a voltage equal to that across the motor when stalled and carrying the maximum current, thus ensuring that the motor is stalled when developing its maximum torque.

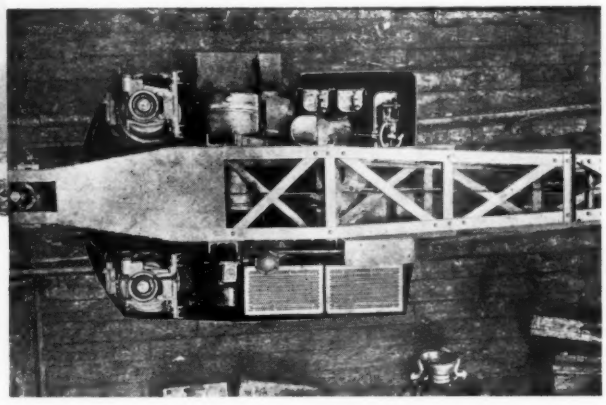
Taking the travel motion as an example, the motor is first connected directly to the generator while the latter is running at tick-over speed and giving insufficient current to start the motor. The engine is then accelerated until the motor starts; if the generator speed were kept at this value the motor would continue to run at a creeping speed, but further increase in engine speed would result in a higher speed of travel until normal full speed was reached. If the crane came to an incline the motor would demand more current and, by virtue of the special characteristic, this increase in current would be accompanied by a reduction in voltage; the crane would slow down until, if the gradient became too severe, it would eventually stop (although the engine would still run at top speed) without excessive strain on the gears, since the maximum motor torque is definitely limited.

With other motions also, variation of engine speed would give automatic protection and control as the load varied.

A six-ton mobile crane equipment, incorporating both rheostatic and throttle control, and including a variable-speed special characteristic variable-voltage generator which can be run as a constant-speed constant-voltage machine, was supplied to the L.M.S. Railway for a stores dump in Scotland. This equipment incorporated a lifting magnet for handling expeditiously general iron and steel scrap, steel chairs, rails, girder sections, and similar material incidental to a railway stores dump.

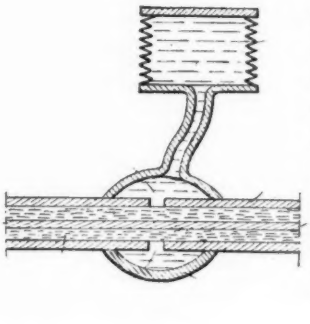
Whilst a constant potential is essential for energising the lifting magnet, the latter is only in use a portion of the time, and consequently for the travel, slew, and derrick motion when ordinary slung loads are being handled, throttle control is definitely advantageous.

The electrical equipment for these cranes was supplied by the British Thomson-Houston Co., Ltd., and accessibility is an important feature of the design and arrangements. As the cranes often operate in confined spaces, and, further, have to be loaded up for transport by rail to different depôts, every possible advantage is taken of the available space for mounting the electrical equipment.



The accompanying illustrations (which are reproduced by the courtesy of Messrs. Henry J. Coles & Co., Ltd., Derby, the manufacturers of the mechanical equipments) show that the cranes are designed to travel either on caterpillars or rubber-shod wheels, according to the class of surface.

The Conservation of H.P. Cables

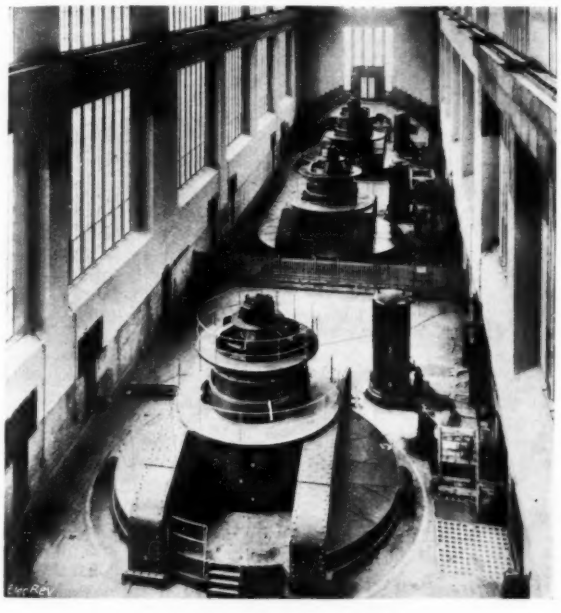


The Société Industrielle des Téléphones, of Paris, has recently been granted a patent in respect of a method of conserving high-voltage cables. It consists essentially of fixing at various points along the length of the cables small collapsible liquid-tight tanks containing material capable of impregnating the paper-insulation of cables, the tanks being connected with the interior of the cable as shown in the drawing.

Power from the Rhine

Some details of the Kembs hydro-electric undertaking

THE most recently completed hydro-electric plant to utilise the water power of the River Rhine is that at Kembs, Alsace, about 7½ miles below the Franco-Swiss frontier. The plant forms part of an extensive development programme which is being carried out in connection with the Grand Canal of Alsace on the French (left) bank of the Rhine and is the first of no fewer than eight hydro-electric generating stations which are to be constructed between Strasbourg and the Swiss frontier. The canal, when fully completed, will have a length of about seventy miles and be divided into eight sections, each having a difference in level of from 33 to 54 ft. This necessitates the construction of that number of locks, the scheme providing that in connection with each lock there shall be constructed a hydro-electric generating station, the eventual total capacity of the eight plants to be 700,000 kW. The work, which is in the hands of the Société de l'Energie Electrique du Rhin, of Mulhouse, was commenced in 1927.



Part of the machine hall

At the Kembs station the construction of a dam on the Rhine has raised the level of the water an average of nearly 23 ft. A 3¾-mile canal having top and bottom widths of, respectively, 492 and 262 ft. and a depth of about 39½ ft. has been constructed to provide a total head at the power plant varying between 39½ and 54 ft. At the site of the installation the canal is divided into two branches, one passing to the navigation locks and one to the power station, which is built directly across and over the corresponding canal branch.

The power house has been built to accommodate six turbo-generator sets of a total of 186,000 kVA capacity, of which five sets have so far been installed, the machine room having a length of approximately 350 ft. and a width of nearly 50 ft.

A general view of the Kembs plant

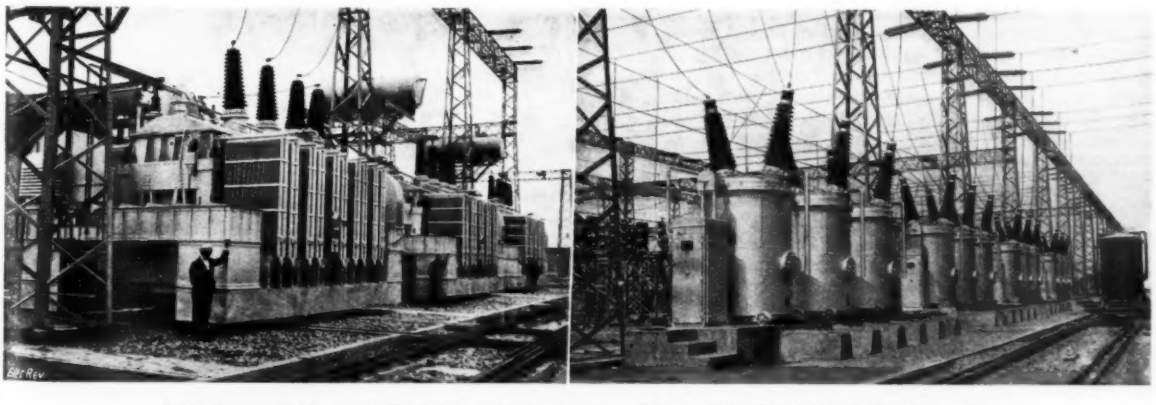
The vertical-shaft turbines were constructed by the Société Alsthom and the Société Alsacienne de Constructions Mécanique with the collaboration of the Société des Ateliers des Charmilles, of Geneva, and are each designed to develop 36,600 h.p. at 93¾ r.p.m., with a maximum head of 54 ft. The three-phase alternators, which are of Alsthom manufacture, are directly coupled to the turbines and generate at 8,800 V (50 cycles). The stators have an external diameter of 31 ft. 9 in., while the total height of the generators is 34 ft. 6 in.; their weight is 460 tons, of which the stator is responsible for 80 tons, the rotor for 245 tons, and the shaft 30 tons.

The power generated is stepped up at an outdoor transformer station, partly to 150 kV for transmission to districts in Eastern France and partly to 220 kV for the lines running to Troyes and the Paris area. The outdoor station belongs to, and is being worked by, the Société Transélectrique, which is affiliated to the Société de l'Energie Electrique du Rhin and the Société des Forces Motrices du Haut Rhin. It comprises three 150-kV transformers built by the Société Savoisienne de Constructions Electriques, of Aix-les-Bains, and two transformers of Alsthom construction so arranged that they can be connected to either the 150-kV or 220-kV transmission lines. A third 150/220-kV transformer is to be added later when the sixth generating set is installed.

Specially Designed Transformers

The specially designed transformers and centralised controls enable each of the alternators to form, with its corresponding transformer, a generating unit which supplies power to the bus-bars at either 150 kV or 220 kV. Means are provided to vary the supply from the generators at the two bus-bar voltages by means of tappings on the 220-kV transformers and by sectionalisers, which enable a section of the 220-kV line to be connected to the 150-kV bars. The 150-kV transformers have each a capacity of 31,000 kVA; while the 150/220-kV sets develop 31,000 kVA at 150 kV and 40,000 kVA at 220 kV.

All the transformers are three-phase and comprise a delta 8,800-V primary winding and a star secondary winding. The latter, in the case of the 150-kV sets, is provided with tappings to enable power to be transmitted at four different voltages between 147 and 170 kV. The 150/220-kV transformers have, in addition, a second tapping arrangement which allows the set to be changed over from 150 to 220 kV and then to supply power at four voltages between 206 and 229 kV. The trans-



Left: Some of the specially designed transformers. Right: A bank of 150-kV circuit breakers

formers are equipped with Buchholz and Asea-Wegener protective devices, excess temperature alarms, and overload protection.

The sectionalisers and circuit breakers were supplied by the Société des Ateliers de Constructions Electriques de Delle, of Lyons. They are of the rotary type with a single blade working in a horizontal plane for the 150-kV section and two blades operating vertically for the 220-V portion.

The station service requirements are supplied by two 1,200-kVA 8,800/380-V transformers, two 220-V 500-Ah batteries, and two 48-V sets of cells of 109-Ah capacity. All the chief auxiliary machines, including the pumps and the lighting installation, are in duplicate. There are also two 1,200-kVA 8,800/6,000-V transformers for the supply of power to the electrical apparatus connected with the locks and dam, the pumping stations, and for the lighting of a small town in the vicinity. The equipment of this part of the plant was supplied by the Alsthom Co.

The 8,800-V transmission line consists of three single-conductor impregnated paper insulated cables sheathed with lead, braided with jute and either two sheets of galvanised steel or tarred textile material guaranteed to withstand a working voltage of 15 kV between phases.

The central control room has been equipped with elaborate illuminated diagrammatic connections and with devices which enable all connection movements to be prepared and verified in advance, and then to make them, by remote control, either directly or by signals.

In order to maintain steadiness of running at the Kembs station and to provide for variations in the demand for power supply, a pumping station is being established so that, at low peak loads, the excess power will be utilised in pumping water into Lac Noire, about forty-four miles away, a generating plant at that point built by the Société Hydro-électrique des Vosges, an undertaking jointly financed by the Société de l'Energie Electrique du Rhin and the Société des Forces Motrices du Haut Rhin, returning the power at periods of high peak demands on the Kembs station.

Some Cooker Improvements

THE new cooker produced by Belling & Co. incorporates the fixed oven without inside elements introduced a few months ago, and there are no projections whatever inside the oven, and so it is claimed there is greater effective cooking space. Ten mica-formed elements nine inches long and each loaded at 175 W slide into pockets welded to the lagged side of the oven interior, so that the lagging surrounds the pockets. Four elements are disposed at each side of the oven, and two at the bottom, and they are only accessible from behind with the backplate removed.

Exterior of the new Belling cooker

The element units are steel encased. Top and bottom oven ventilation is provided, and it is claimed that a perfectly even temperature and quick heating up to 400 deg. in twenty minutes are obtained. An outstanding feature is the plug-in connection for the boiling plates. Actual switch-type contacts have more metal than is usual with plug-in connections, and the units can be lifted out at any angle. There is a 2,000-W boiler-griller, 8¼ in. square, and a 1,600-W, 8-in. diameter "Magnet" boiling plate. Boiler-griller improvements are such that there are now four porcelains instead of two, and two extra dividing fins on the casting. Protection for the wire at each element terminal is afforded by a ball mouth in the porcelain, with the wire threaded through a bead.

The overall dimensions are 42 in. high by 22 in. wide by 17½ in. deep, the oven cooking space is 13¾ in. by 12 in., by 13 in. high, the hot cupboard space is 19 in. by 13 in. by 6 in. In all-enamel finish the cooker is priced at £11, and it is claimed that the cooker provides the largest oven space available for this price. Apart from utility the flush front design with the sunken switch knobs gives a modern note to the general appearance. The door, by the way, is of solid plate, *i.e.*, not panelled.

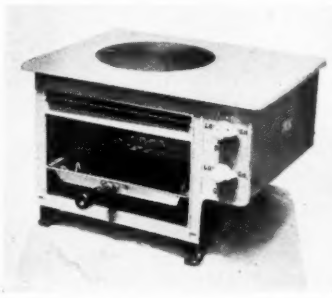
The new C20 cooker introduced by British National Electrics, Ltd., differs from the other cookers of the company's range in that the oven heating is top and bottom and the elements, accessible only from outside the oven, are withdrawable from the side and not the back. One result of this is the elimination of the back connection space. Compared with the C10 cooker, which has approximately the same loadings, the overall depth is 18¼ in. against 21 in., and the overall height and width are the same, namely, 37 in. and 20½ in. The oven cooking space, 12¾ in. by 12½ in. by 12½ in., is served by a loading of 1,600 W, and a 7 in. by 9 in. griller-boiler and an 8-in. diameter boiling plate brings the total loading to 4,950 W. "Chromalox" or embedded-type boiling plates are employed.

The distinctive feature of the new "Magnet" D.C. 333 cooker introduced by the General Electric Co., Ltd. (illustrated in the ELECTRICAL REVIEW of June 9th, p. 812), is that although it is equipped with two 1,800-W hob units, its overall width is still within the builder's limit (21 in.). The overall dimensions, without the splash guard, are 20¾ in. by 17½ in., by 34 in., and the oven cooking space (loading 2,250 W) is 11¼ in. by 13¾ in. by 11¾ in. In grey mottled porcelain enamel the list price is £11 5s.

Breakfast Cookers

Apart from general neatness, compact design, and sturdy construction, the ample hob accommodation and roomy grilling chamber are features of the new No. B.2 breakfast cooker introduced by Carron Company. There is a separate grill loaded at 1,500 W, and the 8¾-in. diameter boiling plate is loaded at 2,000 W. The overall dimensions are 18½ in. by 13½ in by 12½ in. high, and the hob and front frame are vitreous-enamel finished; the rest is black. The list price is £4 5s.

A new table cooker introduced by Siemens Electric Lamps and Supplies, Ltd., is of all cast-iron construction and complete with a 2-kW grill boiler it is sold at 50s. Its outstanding constructional feature is a hinged arrangement at each of the corners securing the sides to the back; one advantage of this form of construction is easy packing for transport.



The "B.2" Carron breakfast cooker

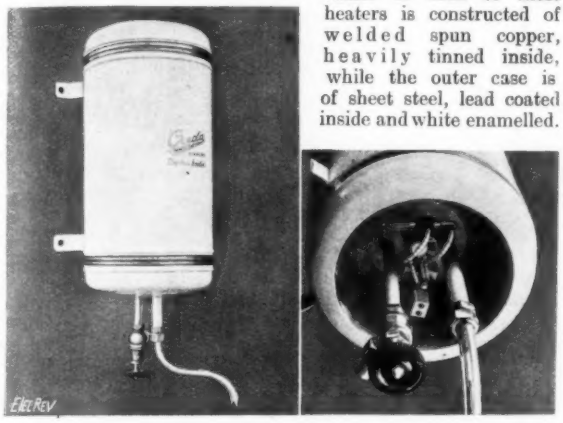
British National Electrics, Ltd., have recently introduced a breakfast cooker equipped with the new Metropolitan-Vickers "Backer" tubular-sheathed type element (illustrated in our issue of June 16th, page 845). By the use of a special deflecting pan for both downward and upward projection both grilling and boiling become efficient operations when conducted separately; the loading is 1,750 W. A kettle specially shaped and sized to fit the element is provided with the cooker which, finished throughout in vitreous enamel, is listed at £3 15s.

Although generally the chief interest in the new No. 1277 "Manor" cooker introduced by Baxter & Caunter, Ltd., probably lies in its comparatively large cooking space for so compact an apparatus, an outstanding constructional feature is the new boiler-griller in which the fireclay element holders are recessed into the underside of the casting, so eliminating air insulation and, it is claimed, increasing the efficiency. An oven cooking space of 12 in. by 11 in. by 10 in. high is served by a separate 1,000-W element as well as the 1,700-W grill-boiler element which apparently may be used for oven warming. An incorporated kettle plug is a feature. The outside dimensions are 21 in. by 14 in. by 16 in. high, and the apparatus is available in all-enamelled finishes. In black enamel it costs £5 17s. 6d.

The "Manor" (No. 1277) cooker

New Water-heating Equipment

THE following notes on some of the recently introduced apparatus indicate that serious efforts are being made to grapple with the water-heating problem. The Revo Electric Co., Ltd., has entered the field with a 1½-gal. (500 W) free-outlet heater, 3- and 5-gal. (both 500 W) free-outlet or pressure equipments, and 12-, 15-, and 20-gal. models (1,000, 1,500 and 2,000 W, respectively), which are designed to provide hot-water service for all parts of the house. The inner container of each of these heaters is constructed of welded spun copper, heavily tinned inside, while the outer case is of sheet steel, lead coated inside and white enamelled.



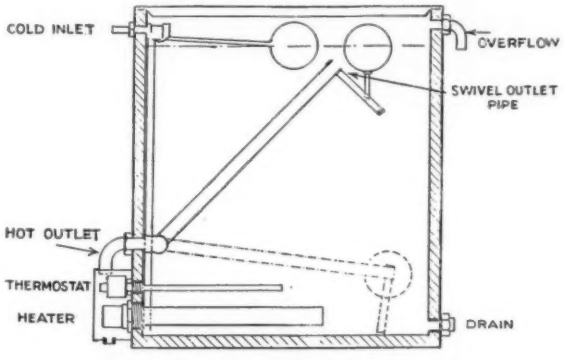
A " Creda " automatic push-through storage heater

All exterior fittings are chromium plated, and where provided the swan neck outlet is of the swivel type. A special connecting block simplifies the element wiring. The nichrome resistor is mounted on porcelain bobbins and staggered so as almost to eliminate sagging. The whole of the element is housed in a special nickel tube. A non-return device with siphonic action is fitted, and an air cushion at the mouth inlet of the outlet tube prevents drip due to expansion.

A special feature is a draw-off plug which enables the container to be flushed out thoroughly as frequently as desired. The 1½-gal. free-outlet heater is listed at £4 10s., and the 20-gal. heater at £16.

A further development by this company is a combined heater and thermostat unit arranged on one stand to afford easy fixing and wiring. It is made for both horizontal and vertical fixing, and in 1-, 2-, and 3-kW sizes.

Domestic Electrification, Ltd., has introduced, in addition to a comprehensive range of " Eziot " automatic thermal-storage heaters from 1½ gal. (500 W, £6 5s.) to 30 gal. (2,000 W, £25 15s.), non-automatic heaters which embody the geyser principle, so that small quantities of water are very quickly available. These non-automatic equipments are of nickel-



Arrangement of the " Highlow " automatic ball valve cistern-tank

plated copper, tinned inside, and the 1½-gal. round and 2½-gal. flat models (1,000 W) can also be equipped with thermostats. An 11-gal. round equipment and 12-, and 15-gal. flat models are all loaded at 3,000 W.

The automatic heaters have copper boilers, tinned inside, and the external finish is white cellulose. The company's " Hotstream " equipment is designed for installation in conjunction with coal-fire water-heating systems.

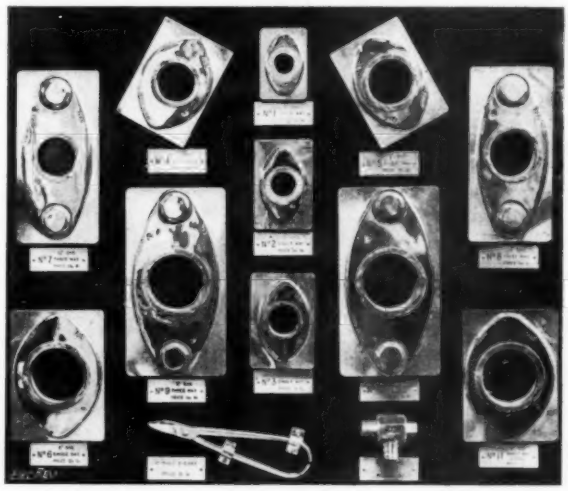
The 25-gal. cylinder is loaded at 2,000 W and is equipped with a thermostat and an enamelled steel lagging jacket, the whole costing £14 15s. The necessary apparatus for converting an existing cylinder costs £7 15s.

A new range of " Creda " water heaters introduced by the Simplex Electric Co., Ltd., embraces 1½- and 3-gal. push-through equipments suitable for fixing over kitchen sinks, &c. They are each loaded at 500 W, and the smaller model costs £4 15s. Six equipments from 5 to 50 gal. are arranged for the same principle of working, but for serving more than one tap, operating either independently or in conjunction with some other system. Ball-valve heaters are available in 5-, 11-, 15-, and 22-gal. sizes (500 to 1,400 W). They are actually standard push-through heaters with the addition of a self-contained ball-valve control tank.

In each case the outer body is of rustless lead-coated steel, and the inner body is of brazed tinned copper. A special device prevents the incoming cold water mixing with the hot water in the cylinder. Provision is made to permit interior cleaning without interference with the water or other connections. All except the 30- and 50-gal. sizes are arranged for wall mounting, but for the 5-, 11-, 15-, and 22-gal. models tubular stands can be provided at extra cost.

A wide range of " Xcel " flange connectors for simplifying the fitting of immersion heaters, thermostats, &c., to existing tanks has been introduced by the Automatic Electric Co., Ltd. A three-way type provides three fixing positions in one unit for a thermostat, immersion heater, and a draw-off cock. The one-way type is suitable for pipe connections, drain cocks, &c. The flanges are each sold with a template and a special holder for inserting the flange.

In the automatic feeding instantaneous water boiler introduced by Archibald Low & Sons, Ltd., the main heating element is fitted into a vertical tube container which is fed with cold water from an automatic ball valve system. When the



A complete range of " Xcel " flange connectors

water in this tube boils it overflows into the outer container ready to be drawn off. When no water is drawn off the container gradually fills with boiling water and the main heater is automatically switched off by a float switch when maximum level is reached, but a small element is left in circuit to maintain boiling point.

Immediately water is drawn off again the main heater is automatically reintroduced. Boiling water is available in seven minutes after switching on, and the continuous delivery capacity is 47 pints per hour. The boiling water capacity is 50 pints, and the loading is 4 kW. Polished copper, nickel plated or " silveroid " finishes are available.

Another recent development by this company is a side-entry circulator and thermostat unit, the main body of which projects slightly upwards from a special brass flange and carries an insulated hot-water outlet tube vertically at its end. Cold water enters at a hole in the horizontal portion on the under side of the flange end. A " Looprod " element (embedded in magnesium oxide) is employed and the terminals, thermostat, &c., are protected by a removable cover. The equipment is made in three sizes, with loadings of 1, 2 and 3 kW for 15-, 30-, and 40-gal. tanks. The smallest size costs £6.

In an automatic ball-valve rectangular " Highlow " hot-water tank the outlet pipe is fixed to a ball float which rises and falls with the level of the water in the tank, so that hot water is always drawn off from the highest point and the rate of outlet supply hot water is independent of the rate of the inward flow of cold water, which can therefore be arranged by means of a control cock to enter slowly and prevent mixing. The lowest point of the outlet swivel pipe is such that the thermostat and immersion heater are always covered with

water. There are five models with capacities of from 10 to 40 gal. and loadings of from 2 to 4 kW.

A shower spray equipment introduced by Santon, Ltd., is designed specially for bathroom use and to give a spray at a predetermined temperature for a given period. The temperature control is by means of an adjustable cut-out (not thermostat) and by an external mixing valve.

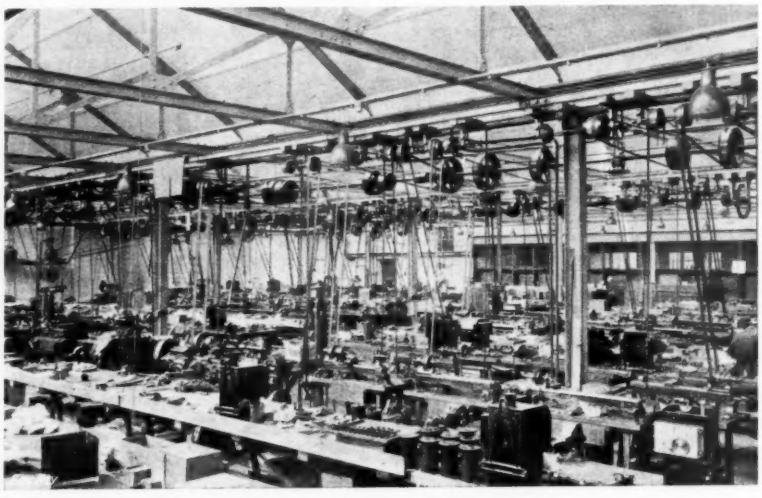
The chromium plated and tinned copper container is supported by blacked bands and wall brackets. The apparatus is loaded at 3 kW and a neon indicator lamp is provided, as well as a tee piece which can be interposed at the lavatory basin tap connection. Twelve feet of curtain rail with runners and curtains ready to hang complete the equipment, which is sold at £7 10s.

The Physical Society at Cambridge

ON Saturday last a party of members of the Physical Society with their ladies and guests, numbering about 230, spent a most instructive morning at the works of the Cambridge Instrument Co., Ltd., which was founded fifty-two years ago.

The winding and wiring bay at the Cambridge Instrument Co.'s works

It will be recalled that the business of Mr. R. W. Paul, with works at Muswell Hill, London, was purchased in 1919, and that an associated company trading under the same name was formed in America in 1922. The company provides employment normally for nearly 600 people, the production of electrical instruments and moulded insulating parts being concentrated chiefly at the Muswell Hill works, while the Cambridge establishment is mainly devoted to the construction of what are generally referred to as industrial instruments, physical apparatus, and special equipment, including apparatus for medical and physiological applications.



Assembly and small instrument lathe shop

In the main machine shop there are capstan lathes, milling, boring, and drilling machines of the most modern types, together with a tool makers' department and a grinding and polishing shop in which instrument parts are prepared for lacquering and enamelling by the spraying process, while in a third section electro-plating is carried out.

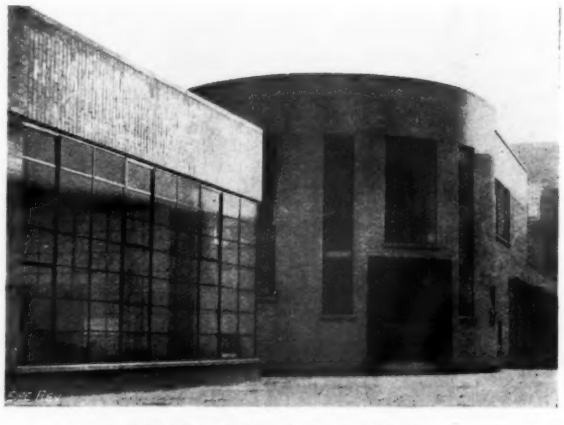
In the electrical wiring and assembly department the winding and testing of delicate coils and the mounting and suspending of indicators and recorders, were watched with interest before passing to the main instrument assembly shop wherein engineering and physical apparatus too varied to enumerate was in course of manufacture. Machinery of special interest in this section of the works chiefly consists of small instrument making lathes, but a gear hobber, micrometer screw lathe, dividing machine, and several engraving machines attracted particular attention.

The testing and standardisation of most of the products seen in course of construction are operations requiring considerable accuracy. Many forms of surface pyrometers, thermo-couples for many processes, and thermo-electric temperature indicators and recorders attracted attention. Among the items on view in the test room were ray-track apparatus, showing continuous emission of ionising particles, and equipment for drawing exceedingly fine glass and quartz fibres and coating them with gold by ionic bombardment in vacuum at high voltage. In the research department examples of the replacement of strong electro-magnets by permanent magnets of cobalt steel, a photo-electric potentiometer for the measurement of small photo-electric currents, hydrogen-ion apparatus for electro-magnetic investigation, and a new torque-balance transmitter for remote reading instruments were a few of the many items demonstrated.

At the Cavendish Laboratory

After luncheon Prof. Rankine thanked the company for its hospitality, Mr. R. S. Whipple, who presided, replying. Most of the visitors then proceeded to the Cavendish Laboratory where a science meeting was held. Prof. Lord Rutherford delivered an introductory address in which he outlined briefly the past ten years' research leading up to the transmutation of matter, and was followed by Dr. E. T. S. Walton, who gave an account of the investigations which he and his colleague, Mr. P. I. Dee, are making into artificial transmutations by means of high-speed protons. Dr. M. L. Oliphant described the methods employed and the ingeniously contrived apparatus he has devised for this work, and Mr. W. B. Lewis indicated some of the results which the magnetic analysis of long-range alpha particles has revealed.

Tea was served in the laboratory and the visitors availed themselves of the opportunity of inspecting, under the guidance of Dr. Kapitza and Dr. Walton, the recently inaugurated Mond Laboratory which has been specially equipped for research at extremely low temperatures and in intense electro-magnetic fields. This was described in our issue of February 10th.



The Mond Laboratory, Cambridge

Wave-form Distortion

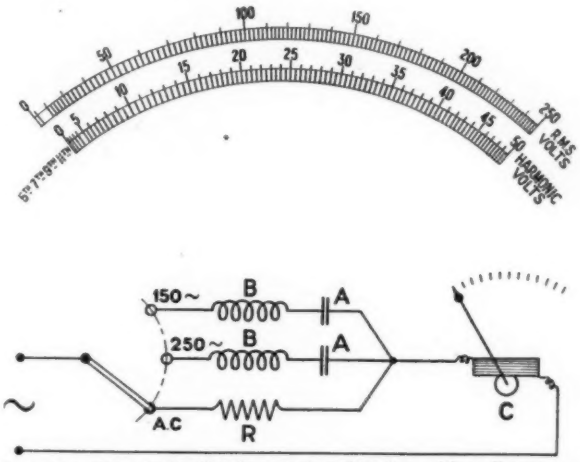
Methods of detection and measurement

TO-DAY the wave-form of a normal a.c. generator is nearly sinusoidal, but unfortunately the conditions of distribution often lead to very severe distortion in the wave as delivered to the consumer. The high peak value of such waves too often causes untoward results, two of the commonest being the breakdown of power-factor improvement condensers and the flashing over of rotary convertors. The sources of such distortion are innumerable, but the use of transformers with a high flux density or of large power transformers lightly loaded, the installation of mercury arc rectifiers, or, again, some unfortunate combination of capacitance and inductance in the distribution system are amongst the most fruitful causes of this trouble.

In order to eliminate the distortion it is of primary importance to locate its cause, and for this purpose a knowledge of which harmonics are present, as well as of their approximate value, is essential. It is also of the greatest importance to obtain a record of the exact time at which distortion occurred, so that it may be determined what plant was in service at the time.

Tracing the Cause

Everett Edgcumbe indicating and graphic harmonic voltmeters give precisely this information, and our drawings show a typical scale of the former instrument with a diagram of its internal connections. The voltmeter shown at C is of the precision moving-iron pattern and has three alternative circuits.



The scale of an indicating harmonic voltmeter, with a diagram of its internal connections

That marked A.C. is fed, in the ordinary way, through a non-inductive resistor R and measures the r.m.s. value of the voltage wave. That marked 150~ comprises an inductor (B) and a capacitor (A) in series, the whole circuit being tuned to 150 cycles per second; that is, to the triple harmonic of a 50 cycle per second wave. The third circuit, marked 250~, is similarly tuned to the fifth harmonic. If each of these two circuits is accurately tuned to its appropriate frequency, its impedance at that frequency is represented merely by the ohmic resistance of the inductor and of the milliampere meter, whereas its impedance to any other frequency will be comparatively high. If, therefore, a distorted voltage wave is applied to the voltmeter terminals with the switch on the 150-cycle stud, the current flowing through the milliampere meter winding will be at that frequency, and will consequently be directly proportional to the value of the triple harmonic contained in the wave. The scales are commonly graduated direct in volts.

The impedance of a circuit containing inductance (L), capacitance (C), and resistance (R), all connected in series, is

$$\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

At the frequency to which it is tuned, $\omega L = \frac{1}{\omega C}$ so that the impedance = R, as has been said. The impedance to other frequencies, although much higher, is not by any means infinite; for example, the impedance at 50 cycles per second might be 3 per cent. of that at 150 cycles per second.

The r.m.s. current due to a 50-cycle fundamental and any third harmonic is given by

$$I = \sqrt{I_A^2 + I_B^2}$$

where $I_A + I_B$ are the currents due to the fundamental and the triple harmonic respectively. To take a concrete case, assume that the triple harmonic component of a 200-V wave amounts to 40 V and that the impedance to this harmonic is 400 ohms and to the fundamental 10,000 ohms. Then I_A = 20mA and I_B = 100 mA. Hence, the total current is $I = \sqrt{20^2 + 100^2} = 102$ mA. Thus the extra deflection due to the fundamental is only 2 per cent.

Actually even this does not represent an error in the reading, since the harmonic scale is arranged to start from a "false zero" situated at the point slightly up the scale to which the index is carried by the fundamental voltage. Any deflection beyond this point is clearly due solely to the harmonic, which it thus indicates with accuracy.

An indicating harmonic voltmeter

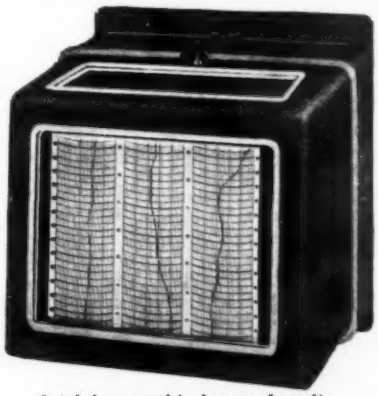
The upper set of graduations in the scale illustrated measures the r.m.s. value of the whole wave, and the lower the fifth, seventh, ninth and eleventh harmonics, according to the setting of a five-way switch. It will be observed that the zero of the harmonic scale is slightly to the right of the "mechanical" zero, for the reasons just mentioned.

Use of the Grapher

A precisely similar arrangement can be applied to the construction of a graphic harmonic voltmeter, which may be tuned to one particular frequency or may be provided with two or more tuned circuits, either of which can be thrown in by means of a switch. The most convenient method, however, is to employ a duplex or triplex grapher, consisting of two or three movements, respectively, tuned to different harmonics, thus recording, say, the third, fifth and seventh harmonics side by side on a single chart.

For many purposes it is sufficient to obtain a record of the hour at which distortion occurred, together with an approximate idea of its value, leaving the analysis into given harmonics to be carried out by an indicating harmonic voltmeter. A grapher of this construction is available and comprises a 50-cycle rejector circuit with impedance and capacitance in parallel, the rejector circuit being connected in series with the winding and the movement itself. Such an instrument gives a negligibly small deflection with a sinusoidal wave, but at once travels over the chart if the wave-form is distorted. These graphers are normally constructed to go right over the chart for a 20 per cent. or 30 per cent. component consisting of any or all frequencies other than the standard 50 cycles per second.

The third, fifth and seventh harmonics have been suggested, but it may be known that the third harmonic has been eliminated, say, by means of a delta-connected tertiary winding on the transformer. In this case, the fifth, seventh and ninth are the only harmonics likely to be causing disturbance.



A triplex graphic harmonic voltmeter

Exact timing is obviously of the utmost importance in such an investigation, and for this reason the Everett Edgcumbe harmonic graphers are usually fitted with a synchronous motor (Synclock) drive for the charts, with the further advantage that no winding or resetting is required; in fact, a length of 60 ft. of chart (corresponding to four weeks' run at 1 in. per hour) can be passed through the grapher without needing attention of any kind.

The Lighting of the Masonic Peace Memorial

A system with many unique devices

THE new central headquarters and administrative centre of English freemasonry, dedicated by the Duke of Connaught on July 19th, stands, as a worthy memorial to freemasons who fell in the Great War, at the junction of Great Queen Street, Drury Lane, and Long Acre, London. The illumination, as befits such a magnificent building, is on a high plane. Some details were given us in an interview by Mr. A. W. Beuttell, the consulting illuminating engineer for the work.

The lighting of the Grand Temple is one with the architecture and decoration. There are no visible luminous sources and there is no daylight. The temple is lined with Botticino (light) marble with Ashburton (dark) as a base and is arranged with a large recess for the dais in the east and smaller recesses each containing a balcony to the south, west and north. The height from floor level of the ceilings of these recesses is 37 ft. Connecting adjacent recesses are four splayed walls each with a doorway, and between all of these the main portion of the chamber rises to a cove of 11 ft. radius and thence to a ceiling 60 ft. above the floor at its centre. The ceiling is coffered and richly decorated in colour, the inner portion is of dark blue silk representing a night sky studded with gold stars and carrying at its centre a large luminous star with sixteen points.

Below the cove, which is rendered in delicate mosaics, is the great cornice containing the principal source of concealed lighting. The function of this lighting is to provide a general illumination *via* the ceiling. The desired effect has been successfully obtained by using standard 100-W concentrating units at one-foot centres and masked from the cove to project to the ceiling and trough reflectors using only 16 W per foot run for illuminating the mosaic cove. An interesting feature of the ceiling equipment is a fibrous plaster grid based on the Greek key, which surrounds the central portion. It serves as a ventilating grid and is surmounted by a casing extending upwards into the roof above. The casing comprises an optical system by which a row of concentrating units at the top projects the light downwards through the grid.

From the ceiling comparatively little light penetrates to the remote portions of the dais and balcony recesses. Over the dais the architects have provided a three-fold lay-light, through which pours a powerful golden light illuminating this important area to a level of intensity noticeably above that of the rest of the interior. The underside of the ceiling is dealt with by two imposing bronze standards carrying indirect bowls, on either side of the organ console.

Illuminated Windows

In every recess at the over-balcony level are three horizontal illuminated windows. From these, too, golden light streams, whilst under the balconies on each side, north and south, are three vertical stained glass windows similarly illuminated. In each case the lighting units are concealed below the sill so as to perform the double function of illuminating the outer window which serves as an illuminated screen and background and to throw sufficient light on to the balcony ceiling to take it out of shadow.

To provide downward light at the back of the balcony recesses ceiling panels running adjacent and parallel to the windows have been fitted with onyx (transparent) marble illuminated from recesses above. The effect is that of a rather deeper gold than from the windows and lay-lights. The total lighting load of the Grand Temple is 72.5 kW, giving 4 ft.-candles in the main area and 6.5 ft.-candles on the dais. The dais lay-lights only are on dimmers, and on the occasion of the dedication ceremony these and certain combinations of progressive switching were most effective in leading up to the opening stages of the ceremony.

The Lodge Rooms

Among the Lodge Rooms No. 6 is outstanding in its architecture; it is designed in plan as an elongated rectangle, with a recess at each side, and there is a large dome at the centre of the ceiling. The architecture did not permit of pendant fittings. There is no cornice, either on the walls or round the base of the great dome. The architects had, however, provided a hole 6 ft. in diameter at the apex of the latter. It was decided to illuminate the lodge indirectly by projecting light through twenty-four lunettes in the upper walls on to the arches and ceilings of the apses. So far as the central dome was concerned, it was to be illuminated from above but so that no direct or transmitted light should reach the lodge below or any portion but the surface of the dome itself.

In the result the 6-ft. opening above the dome was closed by a fitting consisting of a series of concentric louvres. Twelve 500-W projectors were placed above it in a circle and the light projected through the louvres on to the dome. The latter is perfectly illuminated to its base and no light passes or is visible from beyond. The under sides of the sheet-metal louvres were finished artistically and shaped at their outer edges to merge in the scheme of decoration. The effect is very beautiful. Surface brightnesses are neither so low that the fitting appears opaque, nor so high that it would seem to be translucent.

Left: The board room of the Masonic Peace Memorial building. Right: A view of the first vestibule

The lunette units in the wall recesses were designed as ellipsoidal reflectors, and louvres were fitted to reduce their brightness to a comfortable level, the glasses being lined with heat-resisting glass and the whole, as well as all other units in this room, corrected towards daylight quality, so as to preserve the colouring of the decoration.

Single-flash Opal Glass

The descriptions given above cover those features of the lighting equipment of the building which are the most interesting from the technical standpoint. The lighting of the many lodges, the Grand Masters' and Grand Officers' suites, the Museum, Library, and other parts of the building, has been designed to show that modern methods can be used without sacrificing anything of the classic convention. Careful consideration was given to the glassware to be used in the fittings so as to avoid the glare of bright spots and maintain the minimum brightness of panels as high as possible.

Mr. Beuttell selected and specified in nearly all cases single flashed opal, which was used in various tints. We are informed that as a result of its wide adoption in this building the manufacture of this glass was undertaken by a leading glass manufacturer and is now available in its full range as a British product. Interest and brilliance were effectively added to its otherwise somewhat flat appearance by cutting or sandblasting through the flashing.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Earthing—Solid or Artificial?

In reply to Mr. F. P. Phillips's letter in your July 21st issue, the main advantages of the "artificial" earth leakage switchgear as compared with the ordinary leakage protective mechanism are that (1) faulty apparatus is completely isolated before an undesirable potential is attained, even with an abnormally high earth circuit resistance, and (2) the flow of leakage current necessary to effect this isolation is very small.

In my opinion, Mr. Phillips is hardly correct in his description of the protective device as being delicate. In this respect, analogous, although not synonymous, is the no-volt relay of a motor starter. Certainly, both are adequately sensitive for their purposes, but neither is delicate. A point to be borne in mind, too, in favour of the former is that owing to its extremely short period of usefulness the inherent troubles frequently experienced with solenoid relays for a.c. work can legitimately be ignored.

S. H. PARSONAGE.

Chiswick, W.4, *July 24th.*

Electric Light Flicker

I must apologise for not having replied earlier to Mr. Jakeman's letter, but it had unfortunately escaped my notice.

The curve in my article was obtained using a 32-c.p. 220-V metal filament vacuum lamp. This represents a very unfavourable case, as a lamp of higher c.p. or lower voltage would possess a higher thermal storage capacity, and would accordingly be less subject to flicker. The resultant curve represents the visual impression of a large number of students, who were asked to decide whether the light flickered or not, the average being taken in each case.

The curve has proved to be correct for a large number of small and large generating sets supplied by one of the largest Continental firms. Not in one instance was there a complaint. This seems to show that whereas the regulations of the British Standards Institution are perhaps too lax, those of the Research Association are too stringent in actual practice. After all, there can never be a set of figures that is mathematically correct, if the measuring instrument is the human eye.

While not disputing the fact that the results obtained by the Research Association may have been arrived at by very exact scientific means, I contend that my curve is good enough for practical purposes. A decrease in irregularity beyond that would not be worth while from the point of view of increased cost.

A. SKOWRON.

London, W.2, *July 19th.*

Electricity in Fencing

A rather different application of electricity in fencing from that mentioned by Mr. Groves in your issue of July 21st may be of interest.

In 1888, in a theatre in Oporto, a musical comedy included a scene in which two squads of chorus girls gave a fencing display to music. Two lines of floorplates were connected to a 100-V circuit with a suitable limiting resistance. The ladies were wired from a heelplate on one shoe to the sword arm and sword blade of each. Every clash of the blades gave out a shower of sparks. The scene was always encored. At first the girls were scared, but soon enjoyed the exercise. Inspecting and testing their wiring before each performance was a delicate job entrusted to a steady married man.

Streatham, S.W.16, *July 24th.* HENRY M. SAYERS.

Two views of the unusual sub-station at Kennington referred to in a note on page 138

The Reconstructed E.D.A.

With reference to the meeting at the Savoy Hotel on Friday last when the reconstruction scheme was passed, perhaps you would be good enough to find space in your columns for a comment on the future policy of the new Council, which I was unable to make at the meeting as there were many speakers and time was limited.

I wish to suggest that the first duty of the new Council should be to make a general survey of the position and to ascertain those causes which are preventing the development of electricity supply. While admitting the need for propaganda on an adequate basis, propaganda is of no use to the man who wants a supply but cannot get one. I believe it is estimated that there are eleven million homes in the country, of which three or four million have an electricity supply and seven or eight million are still without. This is not because they do not know about it, but because they cannot get it.

The points which I suggest need particular attention, among others, are the possible redistribution of areas, that is where

The Lighting of the Masonic Peace Memorial *(concluded from opposite page)*

The following firms supplied equipment for the indirect lighting of the Grand Temple and Lodge Room No. 6 to the designs of the consulting illuminating engineer:—Grand Temple: Benjamin Electric, Ltd., trough reflectors for cove; Edison Swan Electric Co., illuminated windows; General Electric Co., Ltd., concentrating unit; Holophane, Ltd., dais laylights; and Ingram & Kemp, central star. Decorative design of indirect standards and wall brackets by Mr. Walter Gilbert, who also designed and carried out many other fittings in the building. Lodge No. 6: Troughton & Young, Ltd., lunettes, central dome fittings, and small semi-indirect pendants; Edison Swan Electric Co., Ltd., illuminated windows; and decorative design of indirect standards by E. Heffer & Co. The following firms also supplied fittings: Best & Lloyd Ltd., Birmingham Guild, Ltd., F. T. Cash, L. Dernier & Hamlyn, Galsworthy, Ltd., Higgins & Griffiths, K. & M., Ltd. (electric signs), Osler & Faraday, Ltd., Pringle Art Metal Co., F. H. Pride, and Woodfyt Sales, Ltd.

Messrs. H. V. Ashley and Winton Newman were the architects, Messrs. Burstall & Monkhouse the consulting electrical engineers, and Walter Lawrence & Son, Ltd., general contractors. Suppliers and sub-contractors included: Mather & Platt, Ltd. (iron tanks); J. Starkie Gardener, Ltd. (lift enclosures); Etchells, Congdon & Muir, Ltd., Express Lift Co., Ltd., and Waygood-Otis, Ltd. (lifts); J. Jeffreys & Co., Ltd. (heating and ventilating); Le Grand Sutcliffe & Gell, Ltd. (pumping plant); Drake & Gorham, Ltd., and W. J. Furse & Co., Ltd. (electrical installation); Gillham & Jones (electrical thermostats); Automatic Electric Co., Ltd. (internal telephones); R.M. Radio, Ltd. (loud-speaker installation); Arthur Lyon & Co. (electric clocks); Sturtevant Engineering Co., Ltd. (vacuum cleaning plant).

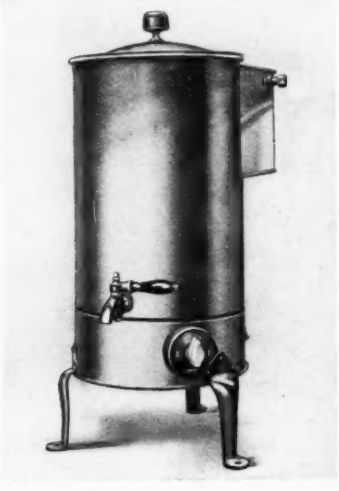
rights have been held for many years without a supply becoming available, the heavy charges which are in many cases made for service lines, the high prices for electricity for purposes other than lighting, which do not make electricity competitive with other means, and the lack of facilities for hiring installations and apparatus. If these were looked into more good could be done by removing obstructions than any amount of propaganda.

As an example of what I mean, in a neighbouring town where the rate has just been dropped to ½d. per kWh plus a rateable value charge and where cookers are hired at reasonable terms, the output for the last month compared with the corresponding period of last year has increased by 45 per cent., and this without any special advertising effort. It becomes more than ever clear that in our business the very best advertisement is a satisfied customer. H. WILSON.

U.D.C. Electricity Department, Ashford, Kent, *July 22nd.*

The Cottages in the Strand

The Building Centre and the architect of the Strand cottages have had many hundreds of letters from people all over the country who want to build similar cottages. It is obvious that these should be built as far as possible by builders in the district of their inquirer, but the difficulty is to make contact with the builders in the different districts who would like to avail themselves of the opportunity to build these houses at or near the price of £225 each, in accordance with the specification.



The "Highlow" automatic feeding instantaneous water boiler (See page 119)

It has occurred to the directors of the Building Centre that they could perform a useful service by extending an invitation to all those builders interested to forward their names to the Centre to be passed on to the inquirer, who will then make his own arrangements direct for the placing of his contract.

As the sole purpose of the Building Centre in creating the competition in the first place was to assist the housing problem by finding the most suitable and economical design, it will be hardly necessary to add that there will be no charge for this service. F. R. YERBURY,

Director, Building Centre.

158, New Bond Street, W., *July 24th.*

Large-scale Cooking at Manchester

With reference to the article by Mr. Easton, of Manchester, in connection with large-scale cooking apparatus, we would point out that all the illustrations of the apparatus given, with the exception of two which are obviously G.E.C. manufactures and the one depicting the still room boiling equipment, show Jackson electric cooking apparatus in the various premises. JACKSON ELECTRIC STOVE CO., LTD.

S. C. Hurry, *Sales Manager.*

London, S.W.1, *July 24th.*

Costing Bulk Supplies

Mr. Bolton's criticism of my article in your issue of July 21st is rather amusing, and I hope he may still remain a "two-part" enthusiast. He states, "Mr. Petersen certainly leaves me standing," but apparently only for a moment as he immediately plunges off the deep end and evidently puts a wrong interpretation on my article. I do not advocate any tariff, the subject matter was "costing" on a load factor basis.

He is altogether wrong in stating that I have constructed a *tariff* with no less than £17 8s. per annum per kW merely to cover the bare costs of supply. It is clearly set out that this cost includes all standing and distribution charges and is the overall cost. Referring to his remarks regarding numerical ratio between kW cost and kWh cost I do not dispute his figure, but the ratio is governed by load factor; the better the load factor the lower becomes the cost per kW expressed in cost per kWh. I certainly do not deal at all with the question of power tariffs; a power tariff must necessarily be below that of a lighting tariff, as the selling price of any commodity to be competitive is only that which it will fetch in the open market.

In order to create constructive criticism I will take a definite stand and state that diversity has been omitted from the figures deliberately, and maintain that whilst diversity factor should have every consideration in the framing of tariffs, it cannot logically be applied to costs any more than the result of the profitable or unprofitable consumer. In fact diversity is more or less in the nature of profit and automatically enters into the relationship between expenditure and revenue. I have no hesitation in stating that no public auditor would certify a cost account in which there was any attempt to apply a credit for diversity factor.

I notice that in the concluding paragraph of his letter he states: "The only way of fitting these human facts into the iron law of the two-part tariff is to alter the ratio of the two parts." With this I certainly agree. Does Mr. Bolton suggest that costing on a load factor basis is incorrect?

South Shields, *July 22nd.* J. C. PETERSEN.

The Grays of Silvertown

I have read with much interest your reference to Matthew Gray and Kaye Gray in reporting the will of Miss Bethia Aitken Gray. I may say that the two gentlemen were very well known to the scholars here of their period. They were always thinking of some fresh way to give the children surprise treats in season, such as strawberries and ice-cream, Scotch salmon, wagonette drives and many others too numerous to mention. I, personally, knew them both as they regularly attended meetings of directors. J. CORDERY, *Secretary,*

Bushey, Herts, *July 21st.* Royal Caledonian Schools.

"Dobrulux" Lamps

We would draw your attention to an inaccurate statement on page 94 of the current issue of your valuable medium. Under the title "The Advertising Exhibition" you refer to the stand of Dobrulux, Ltd., and mention that they show the new gas discharge lamp made by Siemens Bros. & Co., Ltd. This is incorrect; the lamp used in "Dobrulux" signs is made by this company, but it is a neon-filled lamp, so constructed that the glow is always moving.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.

London, E.C.4, *July 21st.*

The Specification for Electric Lamps

I am writing to urge the simplification of the present British Standards Specification for electric lamps. In doing so I feel sure that I am expressing a desire felt by many engineers and large users of electric lamps. The aim of the British Standards Institution is to prepare Specifications for engineering products which shall enable the manufacturer to sell and the consumer to buy these products on a recognised basis of quality. This standard should not only be tested by the manufacturer but as far as possible be capable of verification by the consumer.

Up to now the Specification for electric lamps appears to have been of such a nature as to prevent the consumer carrying out reliable tests with any degree of satisfaction. I understand that the lamp Specification is now under revision so that the opportunity presents itself to attain this desirable simplicity.

It is the expressed desire of the B.S.I. that "in all its endeavours the Institution maintains the community of interest of purchaser and producer," and I am sure that those responsible would wish to carry this out both in spirit and in the letter. LEWIS W. PHILLIPS.

Enfield, Mx., *July 25th.*

Electricity Gives Employment

At an Electricity Commission inquiry into an application for loan sanction for the nucleus of an electricity scheme at Tredegar recently, a suggestion was made that if electricity completely superseded gas in the town, twenty employés at the local colliery would be thrown out of employment because the coal at present purchased for the manufacture of gas would no longer be required.

As this is an argument which your readers in various parts of the country may meet in similar circumstances, may I be permitted through your columns to draw attention to the obvious answer, namely, that any such effect would be more than compensated for by the *increase* of local employment consequent upon the setting up of an electricity distribution scheme in the town, and the general trade improvement, not only directly in respect of electrical appliances, lamps, &c., but by the general livening up of the urban area, and attraction of the community to "go to town" and to circulate money in the purchase of goods to bring their own homes up to the "electric" standard. C. T. ALLAN,

Assistant Manager,

Cardiff, *July 25th.* South Wales Electric Power Co.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Half-million-volt Voltmeter

MESSRS. EVERETT, EDGCUMBE & CO., LTD., Colindale Works, Hendon, N.W.9, inform us that they have just completed and despatched to France what is believed to be the largest voltmeter ever constructed in this country. It has been designed for the high voltage experiments of Professor Chaumat of the Conservatoire National des Arts et Métiers in Paris. The voltmeter stands over 10 ft. high and the diameter of each of the hemispherical electrodes is 3 ft.

It is of the direct-acting attracted-electrode pattern and has ranges of 0-100, 0-250, and 0-500 kV. An advantage of this type of instrument is that it indicates the r.m.s. voltage (or, with an attachment, the peak voltage of the wave) irrespective of whether either of the electrodes is earthed or not. It is, moreover, designed with a very large factor of safety in all directions.

A 500-kV voltmeter

An Earthenware Coffee Percolator

The coffee percolator recently introduced by MESSRS. BULPITT & SONS, LTD., 158, Camden Street, Birmingham is believed to be the first self-contained electrical utensil with an earthenware body.

A short loop-type element enters from the bottom, and the fixing for the element serves also for the plated metal base. The appliance is available in blue and yellow.

The "Swan" earthenware coffee percolator

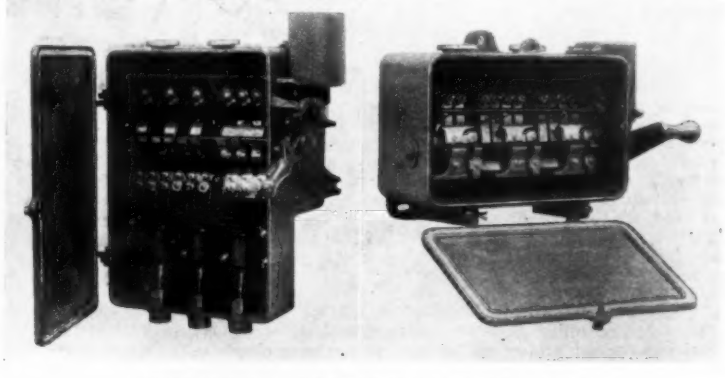
New Starters

We have received from MESSRS. BROOK MOTORS, LTD., Empress Works, Huddersfield, the specifications of two new starters. The type "RSA" combined slip-ring stator and rotor starter for three-phase motors up to 15 h.p. has a no-volt release and three overload coils, and is priced at £11. This starter complies with the Home Office Regulations, and also with the Coal Mines Electricity Regulations, where Regulations Nos. 127 and 132 do not apply. It is of the air-break drum type, and is enclosed in a cast-iron box with a hinged cover. The starter is sealed when closed by an asbestos band, making it entirely weatherproof and at the same time minimising risk of injury to the operator.

The switching drum is carried on an insulated bar and the rotating switch is made from machined castings of massive design. The fixed finger contacts are mounted on moulded "Bakelite" bases, both contact fingers and base being easily removable. The former are duplicated on the stator side, thus allowing the overload coils to be short-circuited until the starter is in the "on" position. Operation is by ratchet handle at the side, and a special mechanism ensures correct operation. Where supplied, the coil overloads are connected in each phase, and are fitted with oil-immersed fixed time lags, and adjustment up to 100 per cent. overload is provided. The maximum rotor current is 45 A.

The three-phase star-delta type starters for squirrel cage motors are designed for the operation and protection of three phase motors, and also comply with the above-mentioned regulations. They are of the air-break drum type fitted in the same way as type "RSA." The optional no-voltage release consists of a keeper held by an energised coil. Upon failure of the supply or reduction of voltage the keeper is released, tripping out the switchgear. The thermal overloads have inherent time lag and the amount of overload is adjustable. Coil overloads can also be supplied, and these are fitted with oil-immersed fixed time lags. The amount of overload is adjustable.

The price is £5 12s. 6d. with no-volt release, and three overload coils for motors up to 20 h.p.; £3 15s. for motors up to 10 h.p.; and £2 10s. with thermal overloads for motors up to 10 h.p.



Brook Motors model "RSA" and star-delta starter

A Special Immersion Heater

The accompanying illustration shows a new "Chromalox" immersion heater produced by GEO. BRAY & CO., LTD., Leeds.

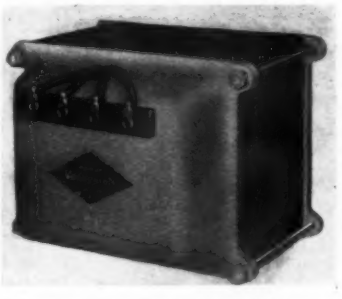
A "Chromalox" immersion heater with special terminal cover

It has a subsidiary moulded terminal box, with large easy-wiring pillar-type terminals, the cover of which can be removed without moving the main aluminium terminal cover, which can thus be sealed to prevent unauthorised adjustment of, or interference with, the thermostat in automatic equipment.

The heater is available with or without a thermostatic switch and with or without a circulating tube. The various sizes are all tapped with a 2¼-in. British standard pipe thread.

Radio and Relay Transformers

VORTEXION, 182, The Broadway, Wimbledon, S.W.19, has introduced a wide range of low-priced radio and relay transformers from very small intervalve sizes to 1-kW models constructed to a very efficient design. Screened primaries are fitted to all receiving set models and are made for standard kit sets. Only British materials are used and either 5 per cent. or 2.5 per cent. regulation is normal; it is claimed that breakdown returns are less than one per cent. All models are available with aluminium frames or neat cast shroudings, and a normal 500-V. 120-mA transformer with three 4-V windings is priced at 19s.



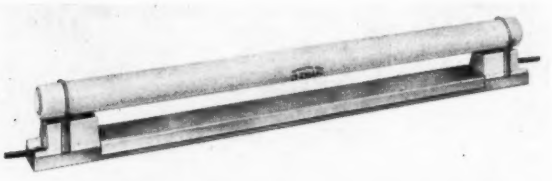
A typical Vortexion shrouded transformer

Architectural "Striplites"

"Osram" architectural "Striplite" lamps, a recent development of the standard "Striplite" lamps, are designed expressly to meet the requirements of modern architectural lighting. They are made on the same principle as the standard lamps, *i.e.*, with spiralised tungsten filaments in a vacuum, but a new method of mounting the filament has been adopted. The lamps give a soft light which is free from glare, and the tubes are lighted uniformly throughout their whole length, as the special caps used are fitted on the side of the tube instead of at the end. When used separately the tubes present the appearance of bars of light, but when mounted end to end they form a continuous band of light, which can be built up into attractive patterns and made to conform to the shape

of any room, by a combination of the curved and straight lamps.

The straight types are 500 mm. long (priced at 17s. 6d. 40 W, and 19s. 6d. 60 W), while the curved types which are 90 deg.



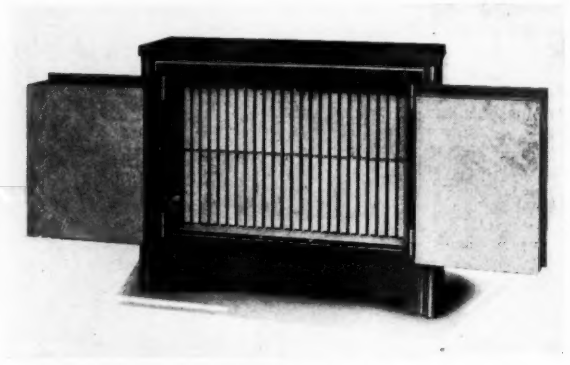
An "Osram" architectural "Striplite" lamp

and 45 deg. arcs of a circle, are made to radii of 318 and 636 mm. respectively, and cost 31s. 6d. and 33s. 6d. for 40 and 60 W respectively.

Storage Space Heaters

The SOAPSTONE PRODUCTS CO., 90, Wood Vale, Forest Hill, S.E.23, has sent us details of two new heaters which have just been introduced. These are models 401 and 402, loaded at 3 and 4 kW respectively, and each consists of a soapstone body which is charged with heat during the night and is surrounded by a lagged metal frame so that the stored heat can be emitted during the day by opening the doors.

Model 401 measures 29 in. by 8¾ in. by 24 in. high, and is priced at £12 15s. finished with heat resisting paint, or



The "Soapstone No. 401" heater

£1 more for vitreous enamel. The 4-kW model measures 33 in. by 10½ in. by 28 in. high, and costs £15 5s. in paint finish (£17 15s., enamel). A new 500-W heater suitable for bathrooms, garages, bedrooms, &c., is priced at £2 7s. 6d.

A Light-sensitive Smoke Detector

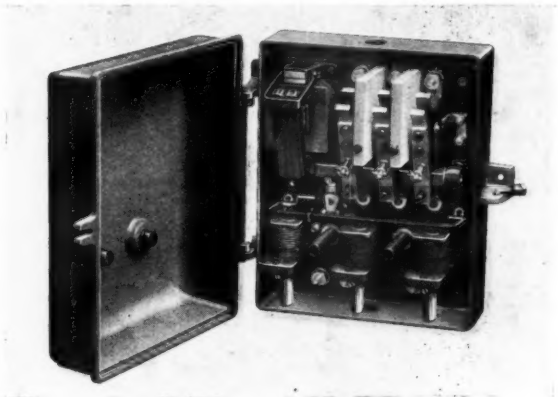
AUTOMATIC LIGHT CONTROL, LTD., Moorgate Hall, Moorgate, E.C., has introduced "Type B" smoke detector and indicator for ascertaining the quantity of smoke in a flue by the absorption of light. It is based upon the use of a selenium bridge, the principle of which was described in our issue of June 9th (p. 830), and can be supplied to operate from either a.c. or d.c. mains. The receiver, housing the bridge and the interruptor motor, and the transmitter, housing the lamp, are of identical design. The amplifier incorporates an iron-wire resistance which compensates for variations in the supply pressure up to 10 V.

The standard remote indicator is an 8-in. diameter flush-type moving-coil meter calibrated in percentage light transmission or optical density; alternatively, a shaded scale similar to the Ringelmann charts employed for comparing smoke colours can be supplied. A green light appears as long as the detector is operating; a red light shows when the smoke exceeds a certain density. A recording milliammeter with a full-scale deflector of 5 mA and a resistance of less than 100 ohms can be used. Among the claims made for the instrument are: (1) Variations in temperature of the selenium have no effect on the amplifier output owing to the use of the bridge with interrupted light; (2) the bridge has many years of life; (3) the under-run thermionic valve also has a long life.

A Simple Contactor Starter

Ready accessibility of the components; robust construction; efficient overload protection for each phase by a simple combination of series coil and oil dash pot; three-point fixing for uneven surfaces; and a liberal section and wiping action of the main contacts under spring pressure, to ensure long life and freedom from replacements, are the outstanding features of the "Elm" contactor starter recently introduced by MESSRS. MILNE & LONGBOTTOM, Mere Lane, Rochdale. It is claimed that it is superior to the ordinary "line starter," because the contactor switch and overload units may be assembled in any combination as required. A standard size for 25 A is available as a direct-on starter with push buttons on the front of the case, and with two or three overload trips; as a starter without the case, with two or three trips; as a three-pole contactor, with or without a sheet-steel case; or as a forward and reversing contactor only, with or without overload trips.

The case dimensions (without projections) for the first-mentioned style are 8 in. by 9¾ in. by 4¾ in., and the price is £2 13s. The switch operating coil is of ample strength to give



A three-phase "Elm" contactor starter with three overload trips

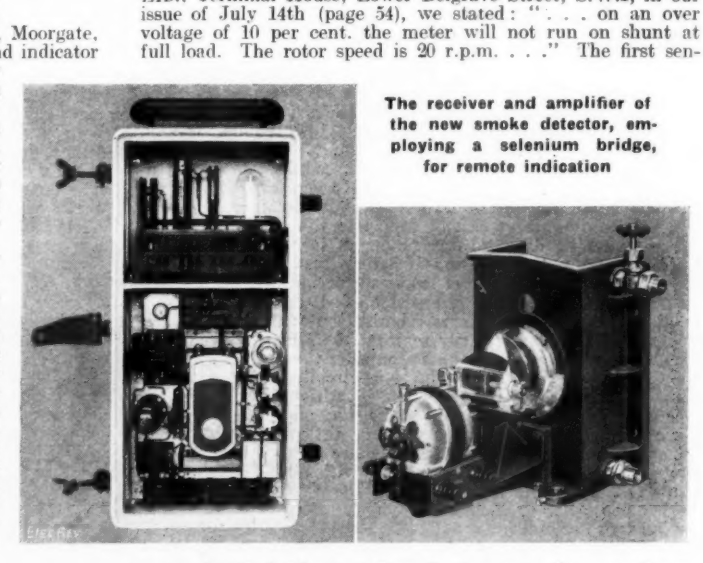
a definite movement, unaffected by starting surges, and the contacts are carried on a "Bakelite"-insulated shaft and are separated by almost unbreakable and removable arc shields. The case is finished grey, with red and black pushes, and all other exposed metal parts, except the bearings and coil supports, are finished in cadmium or tinned.

An Improved Clothes Dryer

The "Tresco" clothes dryer, sold by the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, W.C.2, and illustrated in the ELECTRICAL REVIEW of June 16th, p. 845, has been considerably improved. It is now of all-steel construction. The fan at the bottom drives air over Metropolitan-Vickers tubular sheathed elements, through the cabinet interior, and out of valve-controlled louvres at the top. The cupboard is equipped with suitable hanging rails, &c., for the clothes, and the whole is a compact structure measuring 64 in. high by 24 in. wide by 24 in. deep. It is priced at £14 17s. 6d.

A New House Service Meter

In the last paragraph of our description under the above heading of the new "Z" meter introduced by MEASUREMENT, LTD., Terminal House, Lower Belgrave Street, S.W.1, in our issue of July 14th (page 54), we stated: ". . . on an over voltage of 10 per cent. the meter will not run on shunt at full load. The rotor speed is 20 r.p.m. . . ." The first sentence should finish at "shunt," of course, the second sentence reading: "At full load the rotor speed is 20 r.p.m. . . ."



The receiver and amplifier of the new smoke detector, employing a selenium bridge, for remote indication

The "Arora" Bathroom Fire

The bathroom fire made by the ARORA CO., Loughborough, is now available with a loading of 1 kW, as well as with the 2-kW firebar. The design of both fires is identical, the finish being white enamel with a chromium-plated guard and an earthing terminal. Neither model has a switch on the frame, as in both cases the fire is controlled from a remote point, thus guarding against any risk of shock.

The Reorganisation of E.D.A.

Proposals approved after a lively debate

AN extraordinary meeting of the British Electrical Development Association was held at the Savoy Hotel, London, on Friday last, to consider three resolutions for the reconstitution of the Association. These resolutions, which were proposed by Lord Ashfield (president) and seconded by Mr. H. C. Lamb (chairman of the Council), provided, respectively, that all members of the Association who were not authorised undertakers should resign their membership; that after December 31st, 1933, membership should be restricted to authorised undertakers who agreed to subscribe to the funds of the Association on the standard basis (now one-tenth of 1 per cent. of the gross revenue); and that new articles of association, incorporating the proposals agreed with the Central Electricity Board, should be adopted.

The result of the reconstitution will be to secure greater financial resources, to which the Central Electricity Board will contribute, for propaganda and development purposes. It was made clear at the meeting that the manufacturing and other interests who were originally within the membership but will now resign will continue to co-operate with the Association.

Lord Ashfield, proposing the resolutions, detailed the circumstances leading up to the proposals and the reasons which prompted the Council to recommend the acceptance of the scheme. He, personally, admired the manner in which the Council had performed its difficult task, but the usefulness of the Association had been seriously hampered by lack of adequate financial resources. The revenue for 1932 amounted to £41,604 (of which authorised undertakings contributed £31,452, manufacturers £7,150, contractors £839 and wholesalers £110, the remainder being miscellaneous revenue), and the expenditure was £41,456; this was quite insufficient to enable the Association to carry on its work on a scale commensurate with the size of the industry.

Supply Undertakings Only

Under the powers given by the Electricity (Supply) Act, 1926, the Board appointed a National Consultative Committee, under the chairmanship of Mr. C. D. Taite, to report on this and other matters. The Committee recommended that a national body for dealing with the propaganda, publicity and public relations of the supply industry should be established, the Central Electricity Board contributing to its funds: that E.D.A. should be utilised as the nucleus; that its membership should consist solely of authorised supply undertakings; that qualification for membership (including that of the Central Electricity Board) should be an annual contribution on a basis determined by the Council of the Association, but that until otherwise decided the present basis of assessing contributions should be continued; and that the Council should be drawn only from members, the following bodies having the right to nominate members on the following scale: The Central Electricity Board, six members from its National Consultative Committee; the Incorporated Municipal Electrical Association, five; the Incorporated Association of Electric Power Companies, two; the Provincial Electric Supply Association and the London Electricity Supply Association, one each; and Joint Electricity Authorities who are members of the Association, one to represent them jointly. These sixteen members, together with representatives of the Area Committees, would provide a Council consisting of twenty-four or twenty-five members.

After consultation with the Central Board, the Council of the Association recommended the proposals to the members for acceptance. The expenditure of just over £41,000 per annum on national publicity, continued the president, by an industry whose annual gross earnings on the supply side alone were over £50,000,000, was patently inadequate, representing only 0.08 per cent. of these earnings. If the gross earnings of the other branches of the industry were added to the £50,000,000, the percentage would be infinitesimal. In the opinion of the Council, it was only by securing the support of the Central Board and carrying out the consequent reorganisation of the Association that the necessary funds could be obtained.

A Co-operation Committee

To provide for the continuance of the co-operation between the Council and those sections of the industry not represented thereon, it was proposed to form a liaison or Co-operation Committee, consisting of members of the Council and representatives of the B.E.A.M.A., the C.M.A., the E.L.M.A., the Electrical Contractors' Association, and the Electrical Wholesalers' Federation. It was also proposed to provide for the continuance in some form of the Area Committees and Circles.

Mr. C. S. Davidson (Barnes) led the attack by suggesting that, although some form of reorganisation might be necessary, it was not certain that the wholesale and high-handed proposals submitted were advisable. Therefore, he asked leave to move that the matter be referred back to the Council for further consideration and report, and that if necessary the articles of association be redrafted. The present contributors to E.D.A. had not been given an opportunity to consider increasing their subscriptions rather than accepting the new proposals. He also questioned whether the Central Board had power, under the Statute, to make the contribution, as suggested, of £1 for every £1 subscribed by the industry; it would be embarrassing if the Board were challenged in that respect, and there was just a possibility also that some present municipal contributors might withhold further contributions, so that the position would be worse than before. The interests of the manufacturers and the supply industry were almost identical, and it was difficult to understand, therefore, why the former had been asked to remove themselves from the Association. Again, having regard to the talk about the readjustment of distribution areas, it was possible that when this matter was under discussion the Board might say that the industry was incapable of looking after its own business and that the Board had to come in. In his opinion, however, the phenomenal success of the industry was due almost entirely to the large number of authorities engaged in the enterprise. There were sufficient men of ability in the supply industry without going outside for help.

The president, acting on legal advice, ruled that no amendment could be accepted: the resolutions submitted must be passed without substantial amendment, or rejected.

Alderman Huntsman (Nottingham, Past-president) urged that the proposals had been given long and patient consideration and that there was no point in referring them back. Supporting the proposals, he said that the beggarly sum which the industry contributed to the Association suggested that the contributors could not have appreciated fully the importance of its work. Attractive schemes had had to be emasculated for lack of funds. The development of the grid demanded increased effort, and the proposals were extremely urgent.

Mr. Matthewson (Chester), whilst agreeing that more money should be spent on advertising, complained that the proposals had been put forward without adequate explanation which would satisfy municipal electricity committees. The proposal that the Council should have the right to prescribe the rates of annual subscriptions of members and that its decision need not be confirmed by the Association in general meeting, would alienate a good deal of the sympathy of electricity committees.

Mr. H. E. Blakiston (Ipswich) said he had been sent to the meeting definitely to propose an amendment dealing with this matter; his authority, which had intended to increase its subscription from half to full this year, had deferred this pending a decision as to whether it would have a say in regard to future subscriptions. Mr. J. Dalton (Provincial Electric Supply Association) was also in difficulty, because although the resolutions proposed might be acceptable to that Association if reasonably amended, they might not be otherwise.

"A Step Towards Nationalisation"

Major H. Richardson (Metropolitan Electric Supply Co.), suggested that the proposals were premature, and that in view of the changes occurring in the industry it would be better to postpone such drastic alterations. Again, the proposals might constitute a step towards nationalisation; and it was not nationalisation in its best sense but control of the industry which found the money, by people who were not necessarily a direct Government department, and he considered that a bad principle. Another speaker said that it was a pity that some way could not be found to take advantage of subscriptions by manufacturers, based, perhaps, on turnover or revenue.

Councillor T. J. Shillitoe (Shoreditch) said that under the new proposals his Council would be required to pay £180 or £200 a year, representing an increase of 600 per cent. on former subscriptions; and it wanted to see what benefit was coming from this increased subscription. Shoreditch was highly developed electrically, and no doubt authorities with undeveloped areas wanted the developed areas to pay for those yet undeveloped. He wanted the proposals reconsidered, and said that Shoreditch would withdraw from the Association if the resolutions were passed.

Mr. C. D. Taite (Chairman of the Central Board's National Consultative Committee) pointed out that of the fourteen members of his Committee, six were past-presidents of the I.M.E.A. and five were members of the council of the Power Companies' Association. Such a body should command the confidence of the meeting. Leaders of the supply industry had given evidence to the Committee, and there was remark-

able unanimity among them that at least £100,000 a year should be applied to propaganda and publicity work. Again, the manufacturers particularly had insisted on the view that the organisation of propaganda and publicity should be taken over by the supply industry. The Committee had considered the fact that if all supply undertakings subscribed at the existing rate, the total would be £50,000, and the Central Board had said then that it would provide another £50,000. As to the suggestion that the meeting might be adjourned and the proposals further considered, he pointed out that it would not be possible to call another meeting until after the holidays, and that nothing could then be done for the coming winter to provide the additional funds.

Mr. D. N. Dunlop (B.E.A.M.A.) gave an assurance that the manufacturers were in entire agreement with the proposals before the meeting. He hoped, however, that those whom the Council of the Association might co-opt would include a manufacturer. But the proposals constituted a matter of urgency, and he urged that the bodies represented on the Council would not nominate men who would act contrary to the wishes of the members of those bodies. The manufacturers intended to support E.D.A. in every reasonable and possible way in the future. A speaker asked for some assurance that the E.D.A. Circles would be continued; and suggested an associate or companion membership of E.D.A. which would qualify manufacturers and contractors to serve on those Circles. Mr. Parkinson (Midland Electric Supply Corporation) welcomed the awakening of the electrical industry and expressed the hope that the E.D.A. would in the future have some regard to showroom development.

Mr. R. P. Sloan (North-Eastern Electric Supply Co.), as a member of the National Consultative Committee, sought to allay the apparent fear that the Board sought to secure control of E.D.A., by stating that the Board had insisted throughout that none of its members or its staff should occupy any position on the governing body of the reconstituted E.D.A. Commenting on the remarks of the representative of Shoreditch, that under the new constitution that authority would have to increase its contribution by 600 per cent., Mr. Sloan said that that authority was apparently satisfied with the results, and was satisfied to pay one-seventh of the amount it ought to pay, merely *because* the North-Eastern Company and some other undertakers were paying 100 per cent. He attributed much of the advance his company had been able to make to the spade-work by E.D.A.

Alderman Bolland (Harrogate) suggested that there should be some provision for the nominees of Area Committees to serve on the Council. Sir Percival Bower (Birmingham) urged those present to allow the industry to get on with the job, which had already been delayed too long. Alderman Coates (Watford) maintained that before the resolutions were carried it should be ascertained whether the Central Board had power to subscribe to the Association, because the passing of the resolutions might result in turning away certain subscribers so that E.D.A. might not get financial support from them or from the Board. Mr. P. J. Robinson (President, I.M.E.A.), stated that the Council of that body had resolved unanimously that day to approve the proposed reconstruction of E.D.A. and to urge its members to support it by every means possible.

Mr. Lamb Replies

Mr. H. C. Lamb (chairman, E.D.A. Council), after intimating that a large number of members, not present at the meeting, had expressed approval of the proposals, appeased some of the objectors by making certain promises on behalf of the Council. In the first place, he said that those who found the bulk of the funds, and had done so for many years, felt that it was unreasonable to ask for a further delay. The resolutions allowed another five months, but if the Council found that it was in the interests of the Association to extend that time limit it would take steps to do so. Secondly, he promised that the Area Committees should not be dissolved without the approval of a general meeting of members. The Council was of opinion that they should be continued so long as there was a demand for them, and it gave that undertaking: the Committees, in the opinion of the Council, should still contain members of the bodies outside the Association. Thirdly, the Council would undertake that the present rate of subscription should not be altered without the consent of members in general meeting. As to the power of the Central Board to contribute to E.D.A., the Board was advised that it had the power. Finally, he emphasised that the Council had sacrificed their personal convenience in order to push forward this matter, so that there might be a strong campaign this autumn; therefore, he appealed that there should be no further delay. The resolutions were then put to the meeting, and carried with but a few dissentients.

Thanks were expressed to those sections of the electrical industry which had helped E.D.A. in the past and whose representatives would cease to be members.

"ERA" as a Trade Mark

THE Comptroller-General and Registrar of Patents, Trade Marks, and Designs has recently given his decision in the matter of an application by Messrs. Prentice, Ltd., for the registration of the word "ERA" as a trade mark for fitted electrical switchboards which was opposed by the British Electrical and Allied Industries Research Association.

The ground for opposition was that the Research Association was known among its members and to the industry generally as the E.R.A., and that name was recognised by the technical Press, the Institution of Electrical Engineers, and others. Therefore, the use by any manufacturer of the word "ERA" as a trade mark would undoubtedly lead many persons to conclude that the manufacturer was associated with the work of the Association, and the interested public would be led to believe that the word was used with the Association's concurrence, and that the goods had some connection with the Association, whereas the applicants were not members of the Association. Moreover, as the large majority of important manufacturers of switchgear were members of the Association, the trade mark "ERA" was not a suitable one for a single manufacturer of switchgear or like goods as it would not distinguish the goods of that particular manufacturer even if he were a member of the Association. The use of the word "ERA" in this way would be damaging to the interests of the Association and its individual members.

The applicants maintained that they were seeking the registration of the word "ERA," and not of the initials "E.R.A." The opponents had never used or intended to use the word "ERA" as a trade mark and contended that the initials did not stand for, or represent, the British Electrical and Allied Industries Research Association.

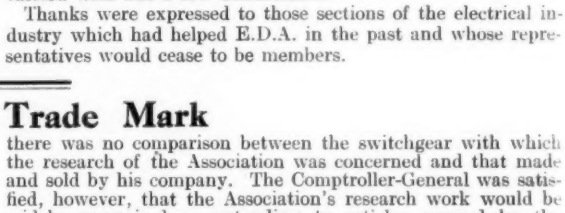
The Comptroller-General notes that the applicants did not rely on any proved user, and he must therefore deal with the application as one for the registration of a new mark.

Mr. Tookey, for the applicants, contended that there was nothing to show that the opponents had used either the word or the initials as a trade mark upon goods. It was, however, well established that it was not necessary for an opposer to rely upon user strictly as a trade mark. So, in the present case, the fact that the opponents might not have used the word or the initials as a trade mark did not debar them from relying upon other forms of user if by reason of such user the applicants' mark might be taken to indicate that the marked goods had some connection with the Association.

Mr. E. B. Wedmore, the secretary and director, gave evidence as to the activities of the Association, but Mr. Prentice, managing director of the applicant company, contended that there was no comparison between the switchgear with which the research of the Association was concerned and that made and sold by his company. The Comptroller-General was satisfied, however, that the Association's research work would be widely recognised as extending to articles covered by the description "Fitted electrical switchboards." He was also satisfied by the evidence for the opponents and extracts from the technical Press that the initials "E.R.A." were a frequently used form of the Association's name.

He considered that the absence of the dots in the word "ERA" did not make much difference to the eye and, as commonly spoken, the words and initials would appear the same and confusion would be caused. He did not think that this conclusion was affected by the fact that the word had been used as a trade mark by other persons. The nearest to the present case was the use of "ERA" in respect of electric fires and the fact, if it were a fact, that the present opponents had taken no steps to stop it did not preclude them from opposing the present application.

He therefore came to the decision that the applicants had not discharged the onus which was upon them of showing that the mark propounded for registration was adapted to distinguish their goods, and that its registration and use by them would not be likely to cause confusion and deception; he must therefore refuse their application.



The main feeder board in the Masonic Peace Memorial building. **(See page 122)**

Parliamentary News

(BY OUR SPECIAL REPORTER)

ON July 18th, in the House of Lords, Lord Snell moved the second reading of the Electricity (Supply) Bill, which had passed through all its stages in the House of Commons.

He explained that the Bill sought to amend Section 16 of the Act of 1919 so as to secure certain readjustments with regard to redundant officers and workpeople employed.

The Bill was read a second time, it being stated that it would probably eventually be incorporated in Lord Falmouth's Electricity (Supply) Bill.

Later on the same day, the latter Bill came before the House, and Lord Falmouth presented it with the amendments of the Select Committee. The Bill was considered in Committee of the House, when Lord Askwith pointed out that the Select Committee which examined it might, without hearing private undertakings, have done a serious injustice to some of those undertakings. Therefore, it was very important that the Bill should be carefully examined.

Lord Plymouth, for the Government, said that the progress which the Bill had made in Select Committee showed that it was of a non-controversial character and deserved general support on the grounds that the powers which it conferred should prove of assistance to authorised undertakings in their relations with consumers and should also facilitate developments on their part. The Minister of Transport considered that his views and those of the Electricity Commissioners were met by the present form of the Bill.

Lord Mersey said that the Bill, as it left the Select Committee, was quite satisfactory to the gas undertakings and they hoped it would be placed on the Statute Book and be of benefit to the undertakers and customers.

The Committee then approved of the amendments made by the Select Committee, and the Bill, as amended, was reported to the House. It may be recalled that the Bill embodies a number of clauses, useful to the electricity suppliers of the country, already in existence in private Acts of Parliament.

Scottish Railway Electrification

On June 19th, Mr. Kirkwood asked the Minister of Transport if he was aware that plans for the electrification of railways in the Glasgow and West of Scotland area had been prepared by the London, Midland and Scottish Railway Company for some years; why these schemes were held up; and what action the Government intended to take to enable the London and North Eastern Railway Company and the London, Midland and Scottish Railway Company to proceed with electrification schemes in Scotland.

Mr. Stanley said that the London, Midland and Scottish Railway Company had informed him that some time ago it examined the question of electrifying its suburban lines near Glasgow, but from the figures taken out it was evident that the electrification of those lines could not be justified on commercial grounds, and that there was no evidence that the circumstances since that time had improved in favour of electrification. He was informed by the London and North Eastern Railway Company that no plans were in existence for the electrification of any of its lines in Scotland.

The Work of the G.P.O.

On July 24th, Sir Kingsley Wood, the Postmaster-General, in presenting the Post Office Estimates, said that during the last twelve months there had been many important technical and scientific developments of which the Post Office engineers could legitimately claim a very prominent part. He was particularly gratified, when Marchese Marconi a few days ago paid a tribute to the Post Office and its chief officers for all that they had done in helping to make radio an efficient medium of universal communication, and he referred particularly to the fact that England had been the first country to construct short-wave stations for direct communication throughout the Empire. One of the most interesting of recent developments had been the increasing use of the same lines and cables for the dual purpose of telegraphy and telephony.

The extensive trunk telephone service was able to provide to-day, without any sacrifice of telephone facilities, multitudes of line channels capable of serving for telegraph purposes also. Most interesting and far-reaching of all had been the utilisation of very short radio waves of the order of five metres or less for short-distance communications. Across the Bristol Channel between Cardiff and Weston-Super-Mare, linked with the inland telephone service, a regular commercial service had been introduced for the first time on a wave length of 4.8 metres in one direction and 5.1 metres in the other, and experience suggested that this system was likely to have a wide field of application, at any rate over short sea routes.

The requirements of the Post Office for supplies of all kinds had reached a value of about £8,000,000 a year; apparatus of foreign manufacture bought by the Post Office represented less than one-half per cent. of the total. Practically all money expended on new telephone exchanges and their equipment, apart from raw material such as copper, was spent in this country. The Post Office had been preparing for a trade revival rather than waiting for it, and had steadily followed a policy of expansion and modernisation. With regard to telephones, for instance, the annual construction programme in relation to the telephone development had built up a large reserve of plant and to-day there was no waiting list, and with suitable distribution they were in a position to provide for some 700,000 additional telephones.

With regard to the provision of automatic exchanges, it was their policy to install automatic exchanges when extensions were required or the effective life of the manual exchange was exhausted, and they were about to accelerate the conversion to automatic working of a number of exchanges where the existing cost had proved abnormally high and where the economies from automatic working would fully compensate for the extra capital cost of the automatic plant. With the consent of the Chancellor of the Exchequer three exchange orders would be placed immediately during the present financial year to the value of some £500,000 for the City of London, Central London, and the Midlands—Birmingham.

Electric Talking-picture Apparatus

On July 20th Colonel Baldwin-Webb asked the President of the Board of Trade whether he was aware that the Western Electric Co., Ltd., of America, had supplied about 2,000 cinemas in this country with talking-picture apparatus and in the contract for the supply of such apparatus had inserted clauses binding the purchaser only to get repairs done or additional equipment or parts from them; that these clauses prevented British manufacturers from getting valuable orders which they were able to carry out; and whether, as the courts in the United States of America had recently decided that such clauses were illegal and void in that country, he would by legislation make it illegal to impose such restrictions in this country.

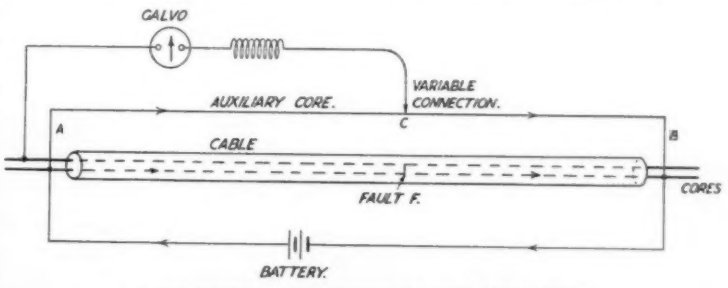
Lt.-Col. J. Colville, who replied, said that his attention had been called to the decision in a United States Court. He was informed that the apparatus and replacement parts were manufactured to a very large extent in this country. As at present advised, the President of the Board of Trade could not see his way to introduce legislation on the lines suggested.

Finding a Multi-core Cable Fault

IT is sometimes necessary in multi-core cable runs to locate the position of a " short " between a pair of cores. In some cases it may prove more economical to replace the cable completely rather than find and repair the fault. When the cable is to be repaired, the following simple method may be employed to determine the approximate position of a fault for opening up the cable. The limits of accuracy will, of course, depend upon the efficiency of connections and the length of cable. Generally, a position plus or minus one or two inches can be obtained.

The apparatus used is very simple, consisting of a galvanometer complete with a length of cable approximately equal to the multi-core cable length, an auxiliary core, a four- or six-volt battery, and a pointed metal prong. With the multi-core cable disconnected at both ends the faulty pair of cores is obtained by a " Megger " test between the various cores. The battery and the external auxiliary core are then connected in parallel with one of the cores. On to one end of the other core is connected the galvanometer, the other side of the galvanometer being attached to the metal prong for making a variable connection on the auxiliary core.

The process of finding the fault is one of balancing the galvanometer, *i.e.*, finding the position on the auxiliary core at which no current flows through the galvanometer. This position, transferred to the main cable, then gives the position of the fault F. Under these conditions the voltage drop across AC equals that across AF. If desired, the connections can be reversed and the voltage drop BC found which will be equal to BF, and the mean of the two positions taken.



A fault-finding arrangement for multi-core cables

Any size of auxiliary core may be used providing the resistance throughout its length is uniform, for, although the currents in the parallel circuit split up in inverse proportion to their resistances, the volt drop, which is the quantity affecting the balance, is equal to the product of current and resistance. For simplicity only two cores are shown in the accompanying diagram.—" A.A.I.E.E."

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

An Indian Problem

A Bombay firm of electrical and mechanical engineers has sent us an inquiry which it recently received. In this the inquirers explain: "We have got a Lipton's tin standing on four iron rods. This tin moves round and round by the handle. But as we are forced to turn it continuously for more than ninety hours now and then, we wish to apply electricity to one of the rods on which tin stands—a wooden pulley and with the help of small motor of 7-8 volts power and strap. We wish to fulfil our above motive to turn the tin for more than 90 hours." They go on to say: "Experience has proved that electricity of a power house for this work finds much more expensive. Consequently shells (? cells) we will need. But we do write that in the Government Telegraph Offices shells are of such a better quality that even after years together they are equally satisfactory—of course acid or water requires now and then. We love such Shells." To complete the matter: "Railfare too, packing charges too, may kindly be given—if not exact—approximately."

We can only hope that our correspondents got the order.

The Inventions Exhibition

The Ninth International Exhibition of Inventions, organised by the Institute of Patentees is to take place in the Central Hall, Westminster, from October 4th to 14th next.

Electricity at a Floral Fête

At the Wolverhampton Floral Fête, which was held on July 18th, 19th and 20th, the Corporation Electricity Department had a large demonstration tent in which was displayed a wide selection of domestic appliances, such as fittings, fires, vacuum cleaners, irons, &c., and also special stands displaying hot-water apparatus and electric cookers, on the latter of which cooking demonstrations were given. There was also a section devoted to agricultural machinery. A general view of the display and the hot-water apparatus stand appears in the accompanying illustrations.

The Wolverhampton Corporation's display of domestic appliances at a Floral Fête

Wages in the Cable-making Industry

We are informed by the Joint Industrial Council for the Electric Cable Making Industry that the rise in the cost of living index figure justifies an increase in wages in the industry as from the third pay-day in August for the period covered by that pay-day. The increase amounts to about 2s. a week for male time workers; 1s. 6d. for youths and boys under 21 years of age; 1s. for female workers 18 years of age and over; and 6d. for those under 18.

An Electrical Garage Equipment Demonstration

During the past ten days the Manchester Corporation Electricity Department, with the co-operation of Messrs. Newtons of Taunton, Ltd., and Brown Bros., Ltd., Manchester, has been giving demonstrations of electrical garage equipment in its demonstration workshop, Dickinson Street. The equipment exhibited included battery charging rectifiers, electric drills, electric polishers, battery repair equipment, air compressors and car washers.

Bedfordshire Agricultural Show

One of the outstanding features of the show held at Ampthill by the Bedfordshire Agricultural Society on July 20th was the display of electrical machinery and appliances for the farm and the farmhouse, arranged by the Bedford Electricity Department. Two types of automatically controlled pumps were shown, one being a "Climax" pump operated by a float switch; an example of the old-fashioned hand pump was also shown. The convenience of the electric drive for plant in the open was illustrated by a 2-h.p. motor attached to a Lainchbury "Superlyte" elevator. A root-cutter driven by a 2-h.p. Brook motor, a grinding mill and a circular saw, with G.E.C. motors of 5 and 7 h.p. respectively, and a tripod motor used for sheep shearing were also to be seen, while the application of electricity to poultry farming was illustrated by a G.E.C. hover of 150-chick size. Demonstrations of electric cooking on "Creda," "Revo," "Jackson," and other cookers were carried on continuously by the lady demonstrators of the Corporation Electricity Department. The demonstration van used by the Electricity Department for propaganda work in the rural area was converted into a temporary sub-station during the show.

The Business Efficiency Exhibition

The Business Efficiency Exhibition will be held at the White City from September 26th to October 6th and will be opened by Lord Melchett.

A Big Radio "Drive"

With the opening of the Radio Exhibition at Olympia next month a nation-wide campaign will be launched with the object of securing half a million more radio listeners by the end of the year. The present number of licensed listeners is a little over five and a half millions, and it is the ambition of the trade to reach the six-million mark by Christmas. The interested parties are the Radio Manufacturers' Association, the G.P.O., and the B.B.C. These three organisations will be responsible for the three largest sections of the Exhibition. The entire main hall will be filled with R.M.A. exhibits, half of the National Hall will be utilised by the B.B.C., which will present full-sized revues and vaudeville shows in a mammoth studio which will seat 2,000 of the public at twice-nightly shows which will also be broadcast, and the rest of the National Hall will be turned into "Magic Village" where the Post Office will demonstrate all kinds of mechanised and electrical contrivances dealing with radio and telephony. The whole of the exhibition will be transferred to Glasgow and Manchester later in the year.

The Building Centre Cottage Competition

In connection with the competition organised by the Building Centre, 158, New Bond Street, London, W.1, for the best designs of cottages costing not more than £250 each, a 72-page booklet (5s. 6d. post free) has now been prepared illustrating sixty of the three hundred designs submitted. A description of the prize-winning cottages, which are on view on the Aldwych site, Strand, London, appeared in our June 23rd issue.

Recent Contracts

Orders recently received by Messrs. John Bennie, Ltd., include lifts for the L.M.S., the L.N.E.R., the Post Office (Faraday Building), and the Law Courts, Belfast, and escalators for the Houndsditch Warehousing Co.

For Sale

The Aldershot Electricity Department has d.c. meters for sale.

The Middleton Corporation has for disposal transformers and a circuit-breaker. (See our classified advertisements.)

New Birmingham Showrooms

New municipal electricity showrooms at King's Norton, Birmingham, were opened on July 20th by Alderman Sir Percival Bower (chairman of the Birmingham Electric Supply Committee). They are situated in Pershore Road South, adjoining the new fire station. The building has three storeys, the ground floor being devoted to showrooms and demonstration rooms, and the first and second floors providing living accommodation. Ald. J. B. Burman (Deputy-Mayor) who presided at a

tea which preceded the opening ceremony, said the fact that £43,000 was paid into the city's showrooms last year and that 176,000 people visited them was proof of their usefulness. Sir Percival Bower said that during the last five years the number of consumers had increased by 73,000, bringing the total to 131,000, the largest number connected to any provincial undertaking in the country.

Bull Motors

All shares and interests in Bull Motors, Ltd., have been acquired by Messrs. E. R. & F. Turner, Ltd., and as a consequence it has been decided to merge the two businesses and to carry on the manufacture and sale of Bull motors as a branch of Messrs. Turner. Formal steps are being taken to wind up Bull Motors, Ltd., and all creditors will receive payment in full. The scheme has been adopted solely for the purposes of efficiency and unification of control. The management and policy will continue unaltered, and all future correspondence should be addressed to Bull Motors (Branch of E. R. & F. Turner, Ltd.), Grey Friars Works, Ipswich).

Prince George Visits Clock Works

On July 21st Prince George visited the works of Messrs. S. Smith & Sons (M.A.), Ltd., and Smith's English Clocks, Ltd., at Cricklewood, where he was received by Mr. D. W. Barrett and introduced to the managing director, Mr. Gordon Smith, who conducted him on a tour of the factory. His Royal Highness paid particular attention to the details of manufacture of Smith's synchronous electric clocks. The general arrangements for the comfort and work of the employés met with his cordial approval.

David Moseley Centenary Celebrations

Two thousand past and present employés of Messrs. David Moseley & Sons, Ltd., attended the sports, dinner and firework display held at Belle Vue, Manchester, last Saturday to celebrate the centenary of the foundation of the business. Messrs. Moseley, makers of rubber and ebonite goods, are said to be the first company in Manchester to have electric lighting, the energy for which was generated by their own dynamos, as well as the first firm in Manchester to install a telephone.

Trade Announcements

Mr. L. Brain, 6, Ripley Avenue, Perth Street West, Hull, has been appointed agent for Hull and district for the Henderson Wireless & Electrical Service, Brighton, for their "Keyway" switchgear.

Mr. T. D. Morgan has been appointed agent for Wild-Barfield Electric Furnaces, Ltd., and G. W. B. Electric Furnaces, Ltd., for South Wales and the West of England. His address is Glaisdale, Porthcawl, Glamorgan (telephone: Porthcawl 30).

Annual Holidays

Higgs Motors are closing their works and offices from August 5th to August 12th.

The offices of the Jackson Electric Stove Co., Ltd., will be closed on August 8th.

The works and offices of Brook Motors, Ltd., Huddersfield, are closing from August 12th to 20th inclusive.

A "Salford Instruments" Tableau

At the recent Hospital Carnival held in Salford, a decorated car was entered by Salford Instruments, Ltd. As will be

A decorated car by Salford Instruments, Ltd.

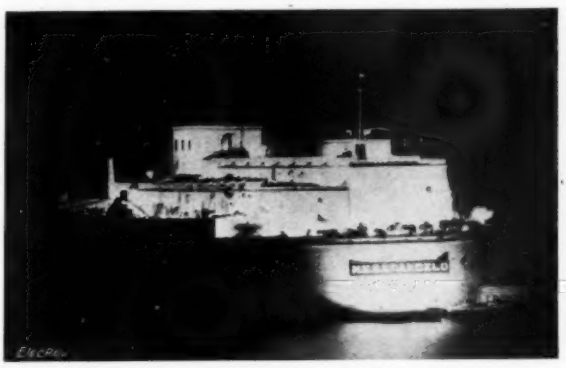
seen from the accompanying illustration, the "Osram" girl was prominent, while over the driver's seat a globe was mounted. The display was an attractive feature of the carnival and excited a good deal of interest.

Hungarian Foreign Electrical Trade

Hungary's imports of electrical machinery and electrotechnical products fell in value from 26,173,000 pengo in 1931 to 13,858,000 pengo in 1932, while exports of these products declined from 38,272,000 pengo to 28,422,000 pengo.

Irish Free State Electrical Imports

A fair degree of activity continues to prevail in the electrical trade in the Irish Free State, the imports of electrical machinery, fittings and cognate apparatus and material attain-



To celebrate its rechristening as "H.M.S. St. Angelo" the 1,000-year-old fort of St. Angelo in the Grand Harbour of Malta was floodlighted for three nights recently

ing a value during May last of £92,858, as compared with £87,195 in the corresponding month of 1932. The appended table gives details of the aggregate imports during the first five months of the current year, and shows an increase of £23,016 or about 8 per cent.

	Jan.–May. 1932.	1933.
	£	£
Electrical machinery	84,305	88,445
Electric wires and cables	38,725	30,670
Radio sets and parts	87,189	94,209
Electric lighting accessories, fittings and parts	20,262	17,527
Other electrical goods	57,554	82,935
Copper wire	3,270	535
Total	£291,305	£314,321

Austrian Electrical Imports and Exports

Austria's imports of electrical machinery and apparatus, which were 37,657 quintals in weight, and 33,747,000 schilling in value in 1931, fell to 21,455 quintals, valued at 17,328,000 schilling last year, when the principal countries of supply were as follows:—

	Quintals.	Schilling (thous.).
Germany	12,861	12,458
Switzerland	1,040	1,108
Czechoslovakia	2,033	834

Exports of electrical machinery during the same period fell from 23,248 q., value 11,854,000 sch., to 14,147 q., value 6,741,000 sch.; of lamps from 5,841 q., value 14,607,000 sch., to 2,313 q., value 5,845,000 sch.; and of other electrical apparatus and accessories from 37,796 q., value 38,768,000 sch., to 20,891 q., value 23,042,000 sch. Leading customers of Austria in the electrical trade are Germany, Jugoslavia, Czechoslovakia, Great Britain, and Holland.

The Polish Electrical Market

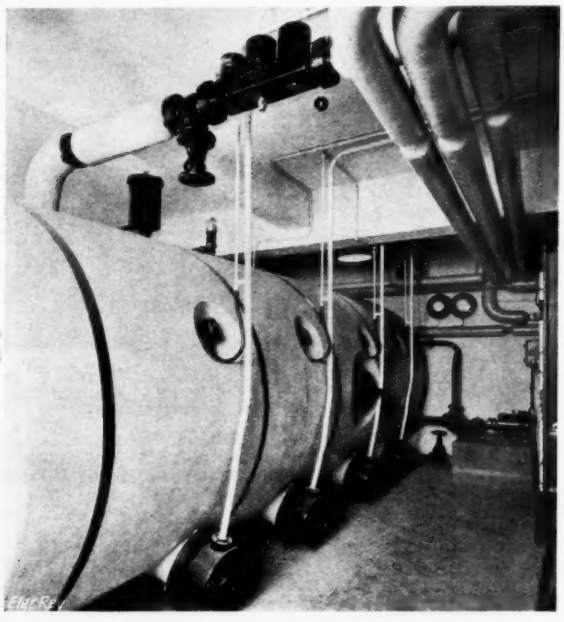
Official statistics have recently appeared of the production and consumption of electrical machinery and apparatus in Poland during the first quarter of this year. The following table shows the chief items:—

	Output. Tons.	Consumption. Tons.
Machinery	76	109
Convertors	9	9
Transformers	37	57
Accumulators and parts	373	308
Switchboards	8	5
Switchboxes	10	13
Switches, fuses and accessories	89	90
Meters	7	16
Insulating tubes and parts	151	175
Telephone apparatus	11	7
Lamps (value in 1,000 zloty)	2,645	3,818
Insulated wire, not lead-covered	213	226
Lead-covered cable	251	259
Radio material:—		
Detector apparatus	5	10
Valves	3	4
Condensers	72	96
Transformers	11	10

The Bankside Thermal Storage Installation

In the new control room and offices at Bankside for the South-East England electricity scheme the requirements of the building for heating and hot water supply are provided from an electric thermal storage system. A horizontal storage cylinder (shown in the illustration on the next page) 6 ft. in diameter by 20 ft. long, is installed, and in it are accommodated four banks of immersion heaters, having a total rating of 160 kW. These heaters are controlled through a switch-panel comprising one 380-A triple-pole main incoming contactor switch with overload releases and shunt trips coupled to four 60-A triple-pole contactor switches. A time switch is also included. The maximum temperature to which the water is stored is 230 deg. F., and the supply of this high temperature

water to the warming system, in which the maximum permissible temperature must not exceed 110 deg. F. is automatically controlled through a magnetic type modulator working in conjunction with a multiple type thermostat situated in a key position in the circulating system. The building is warmed generally by the patent panel system. The pipe coils are embedded in the ceiling, there being approximately 1,000



The thermal storage installation at Bankside

sq. ft. of panel surface. A storage cylinder with a capacity of 300 gallons is provided for the hot water supply and is fitted with immersion heaters rated at 10 kW. The thermal storage system, panel warming and hot water service were installed by Messrs. Richard Crittall & Co., Ltd.

Employment During June

According to the *Ministry of Labour Gazette*, employment in the engineering industry during June showed a further improvement, but continued bad on the whole. The total out of work was 220,953, a decrease of 10,449 as compared with the previous month, the percentage falling from 23.7 to 22.6. Employment in electrical engineering shared in this improvement; the total number of unemployed declined from 15,706 to 13,743 and the percentage from 16.7 to 14.6. In the electric cable, wire and lamp manufacturing group there was a decrease in those unemployed from 19,386 to 17,501 (from 16.5 to 14.9 per cent.), but an increase from 4,699 to 4,917 (from 18.8 to 19.6 per cent.) was recorded in the electrical wiring and contracting industry.

Registered Electrical Contractors

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Contractors at its last meeting :—

Gilbert, G., Chesham Bois, Bucks.
Ainsworth, G. E., Audenshaw, Manchester.
Lee, H. C., Cheadle Hulme, Cheshire.
Makin, J., Denton, Manchester.
Griffiths & Co., Smethwick, Birmingham.
Collier, J. E., & Co., Macclesfield.
Hayes, W., Whalley Range, Manchester.
Ashborn, L. M., Tolworth, Surbiton.
Dunsbier & Rogers, London, W.C.1.
Fookes, E., & Son, Ltd., Portsmouth.
McKnight, T., Salford.
Pye Motors, Ltd., Lancaster.
Burke & Co., Ltd., Old Trafford, Manchester.
Haynes & Fleeson, Manchester.
Donn Electric Co., Manchester.
Tomkinson, W., Salford.
McCollin Bros., Hull.
Hartley, R., Ashton-under-Lyne.
Smith & Douglas, Redhill.
Simcock, W., Droylsden, Manchester.
Wainwright, S. B., Manchester.
Liverpool Co-operative Society, Ltd.
Hull Co-operative Society, Ltd.
Wray, F. D'A., Hull.
Carter, H., Birmingham.
Stornoway Electric Supply Co., Ltd.

At the same meeting six applications were withdrawn and eight were declined.

The "Model Engineer" Exhibition

The trade section of the fifteenth annual "Model Engineer" Exhibition to be held at the Royal Horticultural Hall, Westminster, from August 31st to September 9th, will include a comprehensive display of lathes, precision tools, workshop equipment and scientific appliances. Hundreds of engineering models, many of them actually at work, running under steam or by electricity, will be on view.

Trade with Austria

At the present time the United Kingdom secures only 2.7 per cent. of the total import trade of Austria and takes only 3.7 per cent. of Austrian exports. It was to remedy this state of affairs that an address was given on "Trade with Austria" by Herr Georg Franckenstein, the Austrian Minister to London, at the London Chamber of Commerce on Tuesday.

In the course of his address he observed that the exports to Great Britain from Austria to England included electric lamps, electrical apparatus and equipment, while Austrian imports from Great Britain included iron goods and machinery. British exports to Austria in 1929 amounted to 90 million schillings; in 1932 they were only 35 million. Austrian exports to Britain amounted to 98½ million schillings in 1929, in 1932 they had dropped to 28 million. The most drastic reduction was in respect of electric lamps: exports of these to Great Britain fell from 210 to 20 tons. The export of electrical machinery declined from 790 to 380 tons. Herr Franckenstein concluded with an appeal to British manufacturers to participate in this year's Vienna Fair.

Dr. Kienböck, president of the Austrian National Bank, also spoke on foreign exchange. Viscount Leverhulme presided.

Prices of Materials

Messrs. Edward Till & Co. report, July 26th: India-rubber, Para fine, 5⅜d., ¼d. decrease.

Messrs. James & Shakespeare report, July 26th: No change in the prices of copper bars (best selected) sheet and rod, and English pig lead.

Messrs. F. Smith & Co. report, July 26th: Electrolytic copper bars and sheets, no change; electrolytic copper wire rods, £47, £1 dec.; electrolytic copper h.c. wire, 7$\frac{29}{32}$d., $\frac{1}{32}$d. dec.; silicium bronze wire, 8$\frac{1}{16}$d., $\frac{1}{16}$d. dec.

A New Radiological Society

The Radiological Society of Ireland which has been formed in Dublin has for its objects the advancement and study of radiology, radio-activity, physiotherapy and allied sciences.

Dutch East Indies Trade

The Department of Overseas Trade has published a report by Mr. H. A. N. Bleutt, O.B.E., Commercial Agent at Batavia, on economic conditions in the Dutch East Indies. (Stationery Office, 4s. 6d. net.) Dealing with the import trade, Mr. Bluett states that the depressed state of the engineering trade is reflected in import returns for machinery, technical appliances and tools which, in 1932, reached the lowest value recorded since 1911. Imports under this group fell in value to 23,111,000 florins, against 36,354,000 florins in 1931, and 79,024,000 in 1930, a decline of 70.75 per cent. in two years. There is nothing to indicate that Great Britain has reaped any advantage in this market from the much reduced prices at which home manufacturers have been able to offer standardised machinery for the use of estates, power generating purposes and manufacturing industries. This is in a measure due to the fact that importers had heavy stocks of British, American and Continental machinery on hand when the United Kingdom abandoned the gold standard, which they have sold out, during the current year, at prices well below the original cost. Present indica-

Entering into the holiday spirit on one of the "Ediswan" surf riders now being installed in swimming baths, bathing stations, etc., at both inland and coastal towns

tions with regard to purchases from Great Britain are more hopeful as stocks on hand are now not excessive and several merchant engineers, who previously obtained their requirements from the Continent, have expressed their intention of

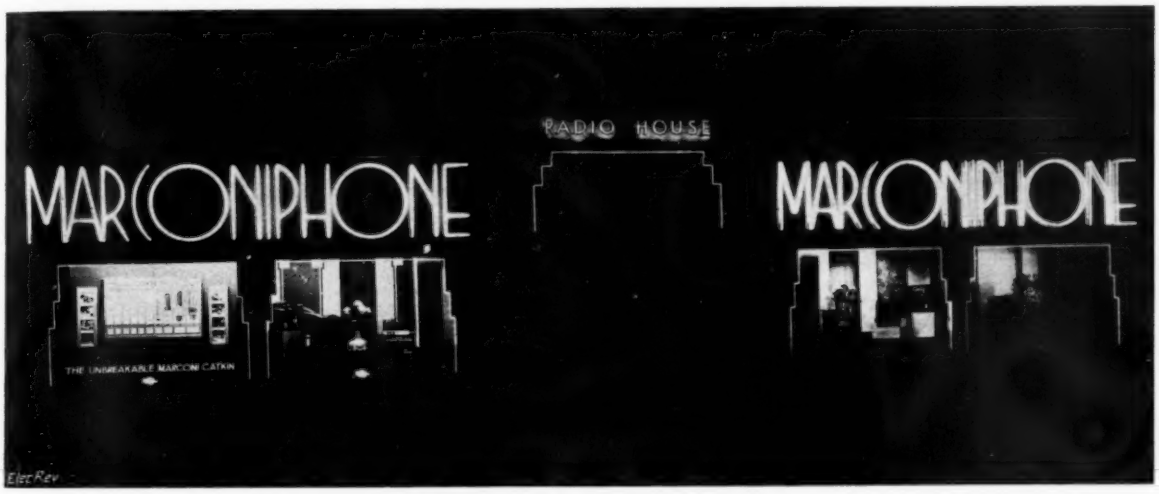
visiting the Birmingham section of the British Industries Fair and placing orders for delivery during the ensuing year if satisfactory agency arrangements can be made. An appendix to the report sets out some of the principal imports under this group during 1932; these include the following :—

	Total value. Fl.	From U.K. Fl.
Steam boilers and parts thereof	216,873	13,248
Steam engines and turbines and parts thereof ...	209,415	100,708
Dynamos, electric motors, transformers, and parts	454,548	40,770
*Electric cables	258,314	5,067
*Accessories for electric transmission	307,648	not recorded
*Accumulators and dry cells...	355,272	46,769
*Electrical appliances for radio telegraphy and telephony	853,974	44,769

* These figures relate to Java only.

Neon Lighting for Marconiphone Building

Effective neon lighting equipment has been installed at Radio House, Tottenham Court Road, W.1, the head office of Marconiphone Co., Ltd. The layout installation, which has been provided by Claude-General Neon Lights, Ltd., is well balanced, and consists of the word "Marconiphone" in red neon along the top of each of the two main windows, and the name Radio House over the centre doorway in red, underlined in green. Also each of the windows is outlined in green. The accompanying illustrations convey some idea of the attractive layout.



Neon lighting at the Marconiphone headquarters

New Catalogues and Lists

George Ellison, Ltd., Perry Barr, Birmingham.—A booklet dealing with overload protection for electric motors, with particular reference to the Ellison overload relay.

Holophane, Ltd., Elverton Street, Vincent Square, S.W.—An illustrated and priced folder of Holophane reflectors for shop-window lighting.

G. A. Harvey & Co. (London), Ltd., Greenwich Metal Works, S.E.—A well-producel catalogue (No. 585), containing illustrations and particulars of the company's "Metalace" ornamental wirework.

McMichael Radio, Ltd., Slough.—A leaflet illustrating the "Duplex Four" radio receiver.

Ateliers de Construction Electriques de Charleroi, 56, Victoria Street, Westminster, S.W.1.—An illustrated booklet describing the "Charlebond" wiring system.

Runbaken Co., 280, Deansgate, Manchester.—The 1933 list of accessories and equipment.

English Electric Co., Ltd., Queen's House, Kingsway, W.C.—Publications Nos. P.59, 573A, and 940A, dealing respectively with colliery equipment, pass-out steam turbines, and oil-immersed starters.

Petters, Ltd., Yeovil.—The July issue of "Petters Monthly News."

Company Liquidations

Trusloves, Ltd., electrical and general engineers, &c., Colchester and Ipswich.—A meeting of creditors was held on July 20th at the Institute of Chartered Accountants, E.C., when Mr. Arthur Webb, chairman of the company, presided. He said that the shareholders had previously met and passed a resolution nominating Mr. T. C. Piper, of Messrs. Bourner, Bullock and Co., Bush Lane House, Cannon Street, E.C.4, as liquidator of the company. No statement of affairs was submitted, but Mr. Piper said that at July 15th last there were unsecured creditors of £9,217, and the bank's claim amounted to £8,062, as well as certain contingent liabilities, the amount of which was at present unascertainable. The total assets amounted to £15,320, from which had to be deducted preferential claims of £3,457, leaving net assets of £11,863, or an estimated deficiency of £5,416. The matter remains with Mr. Piper as liquidator. The creditors also appointed a committee of inspection. The following are the principal creditors:—Anglo-American Oil Co., Ltd., £318; Arthur Brown & Co., Ltd., £163; British Thomson-Houston Co., £102; Burt, Boulton & Haywood, Ltd., £251; Brook Motors, Ltd., £122; Crompton Parkinson, Ltd., £332; Callender's Cable & Construction Co., Ltd., £150; T. A. Evans & Sons, £105; J. H. Godwin, Ltd., £142; "Guinard Pompes," £315; J. C. Ley & Sons, Ltd., £294; R. A. Lister & Co., Ltd., £128; Russian Oil Products, Ltd., £587; Stewarts & Lloyds, Ltd., £110.

B. & W. Radio, Ltd., Avenue Works, Hanover Park, Peckham, and lately of 18, St. Thomas's Street, Borough, S.E.—Under a compulsory winding up order made against this company the statutory first meetings were held on July 18th at Carey Street, W.C. A statement of affairs was submitted showing total liabilities of £9,362 and assets of £750 (absorbed in the preferential and debenture claims). Mr. J. Barwick Thompson, Official Receiver, reported that the company was formed in December, 1930, with a capital of £100. At first the goods were obtained from various manufacturers, but in April, 1931, the company took a factory at Peckham and commenced to manufacture radio sets. In 1932 it began to manufacture electric clocks and loud speakers, and in June of that year Electriclocks & Radio, Ltd., was formed to act as a selling organisation for the company. Debentures of £3,300 were issued on April 12th, 1933, to secure past and present advances, and on June 12th, 1933, Mr. C. E. Tyrrell was appointed receiver on behalf of the bondholders. The failure of the company is attributed to the fact that the anticipated large turnover did not materialise, the overhead expenses being out of proportion to the actual turnover, and to competition by former employés. The liquidation was left in the hands of the Official Receiver.

Rex Radio Corporation, Ltd.—Winding up voluntarily. Liquidator, Mr. J. S. Mason, 45, Bloomsbury Square, W.C. Particulars of claims to the liquidator by August 21st.

Perfection Radio Stores, Ltd.—Particulars of claims by August 5th to the liquidator, Mr. J. W. Westhead, 12, Birley Street, Blackpool.

Faraday Allwave Wireless, Ltd.—Winding up voluntarily. Liquidator, Mr. D. P. Lund, 25, Haymarket, S.W.1.

Bankruptcy Proceedings

E. W. Woodell (trading as Guy's Electric Stores), wireless and electric goods factor, 162, Uxbridge Road, Shepherd's Bush. The public examination of this debtor was held on July 18th at the London Bankruptcy Court, the accounts showing liabilities of £2,630 against assets of £185. In reply to Mr. F. Vyvyan, Official Receiver, the debtor said he had been handicapped for want of capital. His wife and her mother had between them advanced £1,850, all of which had been used in the business. It was the fact that he had never traded at a net profit, and as creditors pressed in January last he was advised to file his petition. The examination was concluded.

B. Bell, electrical engineer, Ladbrooke House, London Road, Biggleswade.—First meeting July 31st at the Chamber of Commerce Room, George Street West, Luton. Public examination September 19th at the Shire Hall, Bedford.

Dennis & James, electricians, 189, Regent Street, W.—Receiving order made July 14th on a creditor's petition. First meeting July 28th and public examination October 25th, both at Bankruptcy Buildings, Carey Street, W.C.

S. Simmons, electrical engineer, 189, Whalley New Road, Blackburn.—Receiving order made July 14th on debtor's own petition. Public examination August 9th at the County Court House, Blackburn.

G. Clarke, electrician, 52, Cottage Beck Road, Scunthorpe.—Receiving order made July 13th on debtor's own petition. Public examination August 3rd at the Town Hall, Great Grimsby.

W. H. Horsfall, electrical engineer, 7, Redcross Street, Liverpool.—Ninth dividend of 4¾d. in the £, payable July 24th at Government Buildings, Victoria Street, Liverpool.

Dissolutions of Partnership

Webb & Barker, radio and electrical engineers, 58, Huddersfield Road, Dewsbury.—Messrs. A. Webb and S. Barker have dissolved partnership. Mr. Barker will attend to debts and carry on the business.

Albany Radio, wireless dealers, 113, Hertford Road, Enfield Wash.—Messrs. H. Chalkley, R. W. Millwood, M. G. Millwood, and D. E. Millwood have dissolved partnership, so far as concerns Mr. Chalkley, who retires from the firm. Messrs. Millwood will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Bedford.—LOAN.—The Town Council is to apply for sanction to a loan of £3,427 for a sub-station, cables and equipment at St. Peter's Broadway.

Bedfordshire.—TARIFF REDUCTIONS.—The Beds, Cambs, and Hunts Electricity Co. has reduced the lighting flat rate from 10d. to 9d. per kWh, and the charge for domestic supplies in the winter from 1½d. to 1d., with the existing charge of ¾d. in the summer.

SCHOOL LIGHTING.—Electric lighting is to be installed by the County Education Committee in further Council schools.

Bexhill.—TIME SWITCHES FOR STREET LAMPS.—The Lighting Committee has asked the electrical engineer to report on the question of installing time switches for street lamps.

Bingley (Yorks).—PROSPECTS OF REDUCED CHARGES.—A successful year is reported by the Electricity Department, there being a gross profit of £11,379 (an increase of £2,661 on the previous year), and a net profit of £2,985 (£1,980 increase). The takings of the new showrooms increased by 75 per cent., the total turnover having reached almost £2,000. Mr. O. G. Cook, the electrical engineer, states that considerable extensions are in progress, and the Council is at present negotiating for new bulk supply terms, after which he recommends an all-round reduction in electricity charges. Until the new terms are settled, the Lighting and Tramways Committee has recommended that the rates of discount on all electricity consumed should be increased from 2½ per cent. to 5 per cent.

Blaydon-on-Tyne. — OVERHEAD LINES EXTENSIONS. — Plans have been approved by the Urban District Council for the extension of the overhead l.p. line at Winlaton for the North-Eastern Electric Supply Co., Ltd.

Bognor Regis.—SUPPLY TO CLYMPING.—The Bognor Gas and Electricity Co.'s latest extension to Clymping has now been completed. The scheme was carried out principally to afford a bulk supply to Lord Moyne's new house, "Bailiffscourt," but an underground distributor was run at the same time to all the cottages in the village.

Brighton.—ANOTHER SATISFACTORY YEAR.—Mr. W. N. C. Clinch, the borough electrical engineer and manager, submitted a good financial report at a meeting of the Electricity Committee last week, showing a net profit of £36,813 (against £47,271 in 1931-32), from which £15,000 will be taken towards relief of the rates. The total revenue showed an increase from £360,112 to £364,760, the number of consumers rising by 4,259 to 31,521. Sales of electricity amounted to 92,334,833 kWh, as compared with 71,940,694 kWh in the preceding year.

MAINS EXTENSIONS.—Mains extensions costing £2,327 are to be carried out.

TRANSFORMER SUB-STATION.—It is proposed to install a transformer sub-station at the new Astoria Cinema in Gloucester Place (£4,170).

LOANS.—Application is to be made for sanction to loans of £10,000 for electrical apparatus for hire, £5,000 for electrical apparatus for hire-purchase, and £50,000 for the assisted wiring scheme.

Carnforth.—PUBLIC LIGHTING CONVERSION.—The Urban District Council is to have the public lighting converted from gas to electricity.

Clowbridge (near Burnley).—A SUPPLY AVAILABLE.—Electricity is now being supplied to Clowbridge by Rawtenstall Electricity Department, and most householders are changing over from gas. An exhibition of electrical appliances has been held at the Baptist School.

Colwyn Bay.—ALL-IN TARIFF FOR PENRHYN BAY.—The all-in tariff is to be extended to Penrhyn Bay, the fixed charge being 20 per cent. of the rateable value of the property concerned, with a "unit" charge of 1½d.

Douglas (I.O.M.).—YEAR'S WORKING.—The accounts of the Electricity Department for the year ended March 31st last show a gross profit of £23,013 and a net surplus of £610.

Dumfriesshire.—LOAN.—The County Council has applied for sanction to a loan of £10,000 for electrical apparatus for hire.

Ealing.—ELECTRICITY FOR THORPE HALL MANSIONS.—The Town Council has again had under consideration an application made by Messrs. W. H. Read & Co., Ltd., for a supply of electricity for the heating and lighting of Thorpe Hall Mansions, and has offered, under certain conditions, to lay at its own expense the requisite h.p. and l.p. mains.

Fleetwood.—APPROACHING SATURATION POINT.—Of the 6,151 buildings in the Fleetwood district capable of receiving supplies of electricity, 83 per cent. are using electricity. Last year the net profit of the Electricity Department was £8,296, as compared with £6,101 in the previous year, consumers numbering 5,117, an increase of 376. Sales of energy rose by 2,760,981 kWh to 8,128,558 kWh. The cost of changing over from d.c. to a.c. up to the end of March was £11,567, the estimated total cost being £60,000.

Gravesend.—LOAN.—The Electricity Committee is applying for sanction to a loan of £40,000 for mains and house service connections.

Great Clifton (Cumberland).—SCHOOL LIGHTING.—The installation of electric lighting in the Council Schools is being considered by the county architect.

Great Oakley.—A SUPPLY AVAILABLE.—An electricity supply is now available.

Great Yarmouth.—SPECIAL ORDER.—Application has been made by the Corporation for a Special Order authorising it to extend its area of electricity supply so as to include parts of the rural districts of the Hundreds of Mutford, Lothingland, East and West Flegg and Blything.

Guisborough (Yorks).—INCREASED SURPLUS.—A net profit of £342 for the past year (against £69 in 1931-32) has been made by the electricity undertaking.

Hamilton.—REVISION OF POWER CHARGES.—The Town Council has altered the tariff for power to 1½d. for the first 12,500 kWh per quarter, 1d. for the next 47,500 kWh, and ¾d. beyond. The previous rates were 1½d. for the first 12,500 kWh, 1¼d. for the next 47,500 kWh, 1d. for the next 37,500 kWh, and ¾d. beyond.

Hastings.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £15,000 for meters, £5,877 for the supply to Rye Harbour and Whatlington, £4,892 for overhead and underground mains, and £985 for sub-station equipment.

Headcorn.—CANVASS TO BE MADE.—The Weald Electricity Supply Co., Ltd., is to make a canvass of the parish with a view to supplying electricity.

Hove.—STREET LIGHTING.—Proposals put forward by the General Purposes Committee for all-night street lighting have been approved by the Town Council.

Irish Free State.—POWER STATION DESTROYED.—The power station at Carrick-on-Shannon, County Leitrim, owned by Mr. T. H. Humphreys. was burnt to the ground on July 19th. Negotiations were pending for the taking over of the concern by the Electricity Supply Board.

Kettering.—REDUCED CHARGES.—The Electricity Department announces a reduction in the charges for electricity to consumers both in Kettering and the outlying areas. Alterations are also to be made in the tariff for late-hour shop window lighting and water heating.

YEAR'S WORKING.—The electricity undertaking last year made a gross profit of £43,044 (£506 decrease) and a net profit of £4,775 (£157 increase). Electricity sold amounted to 12,026,457 kWh, an increase of 739,449 kWh.

LOAN.—Application is to be made for sanction to a loan of £48,000 for mains and services (£28,000), consumers' wiring (£14,000), and domestic apparatus (£6,000).

Leeds.—CHEAPER ELECTRICITY.—Following an exceedingly good year, the Electricity Committee proposes to reduce the general charge for lighting from 4d. to 3½d. per kWh, the rateable value charge of the domestic tariff from 12½ to 10 per cent., and all other charges in proportion. The average charge per kWh will thereby be reduced from 1.92d. to about 1.80d., the concessions costing the Department between £60,000 and £70,000.

Leigh.—RECORD POWER OUTPUT.—Last year the Electricity Department showed a net profit of £6,690. Sales of electricity for power purposes totalled 9,577,152 kWh—a record for the undertaking.

Liverpool.—THE CHANGE-OVER.—Subject to the approval of the Economy Special Committee, the Electric Power and Lighting Committee is to put in hand work costing £20,042 in connection with the change-over from d.c. to a.c.

Lodden and Clavering.—EXTENSIONS.—The Rural District Council has approved mains extensions to Hales by Great Yarmouth Town Council.

London.—HAMMERSMITH.—The Electricity Committee is to provide a supply to the film studios of P.D.C., Ltd., at Riverside Wharf (£1,193).

STOKE NEWINGTON.—The Electricity Committee reports a net surplus of £6,650 for the past year.

ST. PANCRAS.—Mains extensions costing £1,271 are to be carried out.

Last year there was a net profit of £21,487 (against £20,960 in 1931-32) on the operation of the electricity undertaking. Revenue increased from £318,562 to £330,880.

STEPNEY.—The Electricity Supply Committee proposes to apply for sanction to a loan of £40,000 for meters required during the next three years.

Macclesfield.—NO REDUCTION IN CHARGES.—The Electricity Committee has received from the Electricity Co. of Macclesfield, Ltd., a reply to a recent application for lower charges intimating that no further reductions in the price of electricity can be considered at the moment.

Market Drayton.—EXTENSIONS.—The North-West Midlands Joint Electricity Authority is to extend its mains through the parish of Woore, and the Rural Council has decided to offer no objection to the use of overhead lines.

Mevagissey.—IN FAVOUR OF COMPANY'S APPLICATION.—A public meeting held at Mevagissey last Friday unanimously decided to support the Mevagissey Electric Supply Co.'s application for a Special Order for the Mevagissey area, a decision which was also arrived at by the Parish Council.

Peel (I.O.M.).—STREET LIGHTING.—It has been decided to convert the street lighting to electricity, and to put into use the new lighting system on the Promenade in August.

Preston.—A HOSPITAL INSTALLATION.—The purchase of electric cooking equipment costing £359 for the kitchen at Sharoe Green Hospital has been recommended by the Health Committee. The installation of refrigerating plant costing £353 is also proposed.

Richmond (Yorks).—ELECTRICITY CHARGES.—Complaints that the price of electric lighting in the area is exorbitant and is preventing people from using it are being investigated by the Rural District Council.

Russia.—ELECTRICITY PROGRESS.—According to the *Moscow Daily News*, the Rion hydro-electric station, one of the largest power stations in Transcaucasia, is about to be put into operation. The first turbo-generator has already been installed, and the second is almost ready. The third and fourth sets will be erected next year. The recent starting of a new 50,000-kW set at the Magnitogorsk central electric station has increased the capacity of the plant to 98,000 kW. The construction of a steam-operated power station of 56,000-kW capacity has been commenced at Kramatorsk, Don Basin. This station will supply steam and electrical power to the new Kramatorsk machine-building plant and will heat the houses of the town.

Salford.—INCREASED SALES OF ELECTRICITY.—There was an increase of 9½ per cent. in the sales of electricity by the electricity undertaking during the year ended March 31st last. Mr. L. Romero, city electrical engineer, in his annual report, states that the increase has been largely due to reductions in charges made in April and October, 1932. The undertaking has made a net profit of £35,554, of which £15,000 has been placed to the relief of the city rate.

Scotland.—PROGRESS IN WIGTOWN AREA.—A development of the South of Scotland electricity supply took place recently, when the current from Kilmarnock *via* Tongland, in the Stewartry of Kirkcudbright, was switched on to the new lines which stretch across the county of Wigtown from the Cree to Stranraer.

Sittingbourne.—EXTENSIONS.—The Kent Electric Power Co., Ltd., is to construct a transmission line from Sittingbourne to Sutton Valence, which will give a supply of electricity to villages *en route*.

Southend-on-Sea.—HOUSE WIRING INSTALLATIONS.—The Town Council has decided to have 122 houses to be erected on the Leigh Estate wired for heating and cooking by the Electricity Department at a cost of £3 per house.

MAINS EXTENSIONS.—Mains are to be laid in nine thoroughfares (£1,656).

AUTUMN ILLUMINATIONS.—The cliffs and other portions of the borough are to be illuminated and floodlighted from the commencement of the Carnival Week to the second week in October.

Spalding.—COUNCIL HOUSE SUPPLIES.—The Rural District Council has decided to have electricity installed at Council houses at Gosberton Westhorpe, Starlock Drove, and Donington. The wiring work is to be put out to contract.

Swansea.—FURTHER TENDERS FOR SCHOOL INSTALLATION.—The Education Committee is to invite further tenders for the electrical installation at Mayhill Junior Girls' School.

Thetford.—INQUIRY.—A Ministry of Transport inquiry was held last week into the application of the East Anglian Electric Supply Co., Ltd., for permission to use overhead lines for the supply of electricity to the town. It was stated that the company had bought the old undertaking, which, with replacement of machinery, had cost £4,300. There was at present no supply available for cooking or for manufacturing purposes, and the amount of underground cabling that the company had undertaken to do in its original plan worked out at 38 per cent. in proportion to the overhead lines proposed. There now existed in the town about 2½ miles of overhead lines, and the company proposed to put up 3½ miles. Attempts at a compromise were made, but failed, and eventually the inquiry was adjourned until August 11th.

Tottenham.—REWIRING OF TOWN HALL AND BATHS.—At a recent meeting of the Municipal Buildings Committee, the engineer reported that it was necessary for the whole of the wiring in the town hall and baths to be renewed and placed in screwed steel tubing. The North Metropolitan Electric Power Supply Co. has been requested to submit an estimate for the work, which should be carried out immediately, together with another estimate of the cost of carrying out the remainder of the renovations.

Tredegar.—INQUIRY.—Conducting an inquiry last week into the application of the Urban District Council to borrow £6,650 for carrying out the first section of its proposed electricity scheme, Mr. Henry Nimmo, inspector appointed by the Electricity Commissioners, stated that Tredegar was the only town of its size in the country where there was not an electricity supply. Major Ivor David, consulting engineer to the Council, said that he was quite confident that the scheme could be run at a profit—in fact, he believed it would be a paying proposition after six months. The number of gas consumers might be reduced, but he thought that the scheme could be run beneficially alongside the gas undertaking. Mr. Walter Davies, gas and water engineer, said that it was his chief interest that the gas undertaking should pay its way, and it was proposed to confine the electricity scheme at first, more or less, to the shopping centre. Commenting on the proposals, Mr. Nimmo said that they should have gone in for a scheme to cover the whole of the town so that all might benefit, irrespective of the damage to the gas undertaking. The inquiry was closed.

Wadsworth (Hebden Bridge).—STREET LIGHTING.—The Parish Council has decided to adopt electricity for public lighting.

Wallasey.—BATH LIGHTING.—The Baths Committee has approved a scheme for lighting the New Brighton bathing pool, with both under-water and over-water illumination, at a total cost of £840.

Weldon (Northants).—NEW SUPPLY.—A supply of electricity is now available.

Wetheral (Cumberland).—LIGHTING INSTALLATION.—The Parish Council is to install electric lighting in the Council Offices and meeting room.

Winlaton.—SCHOOL LIGHTING.—The Board of Education has approved the installation of electric lighting at the Council School.

Wooburn.—PUBLIC LIGHTING.—The Parish Council has approved an agreement with the Cookham and District Electricity Corporation, Ltd., for public lighting.

Municipal Supply Undertakings' Working Results

Town.	Engineer.	Revenue. 1931/2.	Revenue. 1932/3.	Working Expenses. 1931/2.	Working Expenses. 1932/3.	Net Profit. 1931/2.	Net Profit. 1932/3.	Sales of Electricity. 1931/2.	Sales of Electricity. 1932/3.
		£	£	£	£	£	£	kWh.	kWh.
Accrington	A. W. Clegg	85,175	87,545	40,249	41,586	6,989	7,710	19,042,674	22,062,105
Barking	W. E. Kidner	64,655	70,852	42,143	40,651	10,227	15,483	7,157,715	8,578,229
Barrow	H. R. Burnett	102,848	100,094	58,265	56,076	7,924	6,232	21,148,710	21,733,799
Bath	J. W. Spark	122,626	130,333	61,788	64,594	6,814	9,196	23,436,919	27,118,508
Bingley	O. G. Cook	28,486	30,952	—	—	1,065	2,986	2,731,684	3,073,493
Birmingham	F. Forrest	2,019,436	2,118,731	1,019,836	1,114,730	175,312	185,614	388,758,092	434,742,779
Blackburn	W. A. Royle	206,687	205,369	67,897	66,355	6,998	8,347	26,484,089	26,643,181
Bolton	H. E. Annett	310,939	315,016	149,980	151,951	52,670	48,742	66,610,422	68,347,345
Bromley	W. G. Trend	63,495	67,547	35,477	39,179	9,938	11,667	5,528,972	6,920,069
Burton	T. Hall	129,903	137,709	64,958	82,910	8,021	16,791	23,529,675	24,525,243
Bury St. Edmund's... ...	A. E. Knights	20,249	21,646	8,820	10,392	1,908	329	1,721,961	1,949,373
Cardiff	C. G. Morley New ...	288,539	287,119	148,632	154,606	42,858	37,649	2,875,649	2,783,646
Cheadle and Gatley... ...	R. W. Willis	31,556	37,112	—	—	609	338	3,570,528	4,064,922
Chester	S. E. Britton	101,573	114,035	62,510	66,183	3,633	5,827	11,811,748	14,121,921
Chesterfield	D. H. Davis	83,419	84,468	42,434	43,649	7,104	5,689	11,859,939	12,612,653
Colchester	W. Frisby	93,211	112,092	45,494	54,435	5,500	8,348	8,194,973	10,603,733
Colne	J. H. Thompson ...	39,362	42,195	25,065	27,308	1,015	1,812	4,217,215	4,702,626
Dover	R. C. Harpur	47,924	51,996	24,808	28,208	4,796	6,318	3,684,911	3,811,151
East Ham	W. R. Elliott	136,318	141,850	81,418	92,312	5,281	4,425	16,686,608	17,921,189
Exeter	A. L. Keet	110,506	123,920	49,282	68,596	5,686	5,757	11,582,872	15,396,206
Glasgow	H. Bell	1,324,677	1,257,784	693,187	568,617	27,121	134,983	237,770,666	† 235,000,000
Grimsby	S. R. Windle	128,853	143,352	67,652	77,838	11,781	12,998	21,762,691	28,754,638
Guildford	W. E. Affleck	82,774	97,365	34,689	41,226	—	17,483	12,610,801	19,821,264
Halifax	E. A. Mills	195,973	199,496	99,559	91,788	19,361	31,947	34,211,725	37,390,076
Hampstead	J. Leadbeater	188,732	198,446	139,409	150,099	40,032	41,455	26,449,806	28,104,552
Kingston-on-Thames ...	T. A. Kingham	69,720	80,581	48,053	50,999	1,447	7,593	8,387,964	9,905,995
Kirkcaldy	O. F. Francis	42,446	43,320	24,449	22,944	*2,048	*1,075	6,011,696	5,834,826
Leeds	C. N. Hefford	700,302	856,548	322,612	342,477	56,534	104,933	153,615,613	186,445,444
Leicester	J. Mould	472,793	527,517	197,407	230,027	65,108	84,459	75,241,416	85,709,261
Manchester	H. C. Lamb	1,864,603	1,890,722	1,157,783	1,102,320	43,332	161,129	398,565,408	409,749,833
Nottingham	G. H. Lake	488,062	561,471	198,412	216,193	54,620	71,011	66,268,510	79,920,036
Pudsey	H. H. Parker	15,068	17,978	9,353	10,524	760	1,166	1,418,474	1,842,186
St. Marylebone	C. H. Smyth	567,936	591,755	378,657	351,273	693	42,072	120,703,807	129,796,956
Stoke-on-Trent	C. H. Yeaman	226,546	237,827	156,315	159,770	9,775	16,112	41,822,711	46,526,619
Taunton	A. J. Howard	36,971	40,201	22,056	26,218	4,953	1,903	—	—
Tunbridge Wells	R. N. Torpy	—	111,321	—	56,406	—	15,688	18,832,966	21,740,491
Weymouth	G. Nicolson	43,238	46,569	21,310	22,160	6,371	6,902	4,156,384	4,703,133
Worcester	C. M. Shaw	102,812	96,879	49,761	47,254	9,901	10,483	16,376,420	17,851,729

* Loss. † Approx.

Traction

Australia.—RECONSTRUCTION OF BALLARAT TRAMWAYS.—The Victoria Electricity Commission has informed the Ballarat City Council that it is asking the Government for a substantial grant of unemployment relief funds for the reconstruction of the tramways in Ballarat and Bendigo. It was stated at a Council meeting that the reconditioning would cost £150,000, and that trolley-buses would cost £80,000.

Brighton.—VOLK'S ELECTRIC RAILWAY JUBILEE.—Volk's Electric Railway will celebrate its jubilee on Friday next, having been inaugurated on August 4th, 1883. To mark the occasion, the Mayor of Brighton will drive the first car from the Aquarium station to Black Rock, inaugurating the second fifty years. In the evening a firework display will be given at Black Rock.

France.—RAILWAY ELECTRIFICATION.—The Paris correspondent of *The Times* reports that the train which was used last week to open the newly electrified stretch of the Orléans Railway between Orléans and Tours made a record for France by covering the 145 miles between Paris and Tours at an average speed of 74½ miles an hour. The engine drew seven Pullman coaches and a guard's van. The Orléans Railway Company has now electrified 221 miles of main line and 803 miles of single track.

BATTERY TRACTION VEHICLES.—In a recent issue of *La Traction Electrique*, Monsieur L. A. H. Pahin gives some particulars of the battery traction vehicles which have recently been adopted on part of the secondary railway system of the Compagnie des Chemins de Fer de Sud-Ouest. The motor coaches, which were constructed by the Société Générale de Matériel Automobile Ferroviaire, have seats for forty passengers and a luggage compartment, and are mounted on two bogies. Four 50-h.p. 125-V motors are used, these being of the self-ventilating type and provided with roller bearings. The necessary electrical energy is supplied by a battery of 135 cells arranged in five boxes and of a total capacity of 800 Ah at a five-hours discharge rate. The control mechanism is in duplicate, so that the coaches can be driven from either end. It is stated that the vehicles are covering a daily distance of about sixty-seven and a half miles on one charge, and that occasionally the coaches have to haul three 12-ton trailers and a luggage van.

India.—DIESEL LOCOMOTIVES.—Two Diesel-electric locomotives are to be purchased by the Railway Board for experimental purposes on the Indian State Railways. They will each to be of 800 h.p., and the estimated cost is about £26,000. They will be used on the Lahore-Karachi and the Sukkur-Sibi sections of the North Western Railway, where coal is expensive and water scarce.

Italy.—UNDERGROUND RAILWAY FOR MILAN.—An official commission of public works is visiting Milan to examine on the spot the scheme for an underground railway system which appears now to have been definitely decided upon. The Metropolitan line will serve also numerous populous suburbs, including Monza, Pavia, and Magenta.—*Morning Post.*

London.—TRAFFIC SIGNALS.—The most extensive installation of automatic traffic signals on the flexible progressive principle in London since the equipment of Oxford Street was switched on at Brixton last week by the Mayor of Lambeth, Mr. H. W. Norman. The installation consists of twenty-one standards, and has been installed by the Revo Electric Co., Ltd. It is arranged that the traffic shall move at approximately 15 miles an hour.

L.C.C. TRAMWAY ACCOUNT.—Savings of £117,164 in working expenses and a fall of £49,644 in the requirements for loan charges are said to be the principal reasons for the reduction in the deficiency on the operation of the London County Council's tramway system from £109,135 in 1931-32 to £38,396 in 1932-33. For the year ended March 31st last the total revenue receipts amounted to £4,116,154, a decline of £95,449 as compared with the preceding year, while the number of passengers carried fell from 693,303,349 to 679,414,125. The car mileage was 69,462,805, as compared with 70,161,864. The total net capital expenditure amounted to £19,530,452, of which £205,509 represents expenditure during 1932-33. The installation of the new plant at the Greenwich power station has been completed and the plant has been put into regular operation. Various improvements in car services were made and several new fare facilities were introduced during the year, including 6d. evening "ride-at-will" tickets; the issue of cheap Sunday "all-the-way" tickets was renewed. The year ended March 31st last was the last complete one in which the trams operated under the control of the L.C.C., for the system was taken over by the London Passenger Transport Board on July 1st.

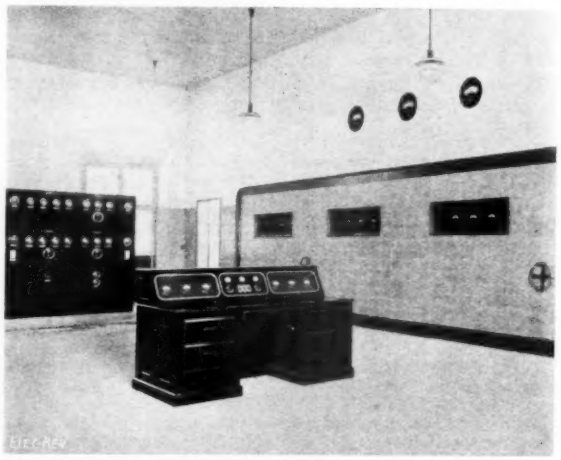
BRAKE EXPERIMENTS.—Experiments in fitting trams with air brakes are being carried out by the London Passenger Transport Board. Apart from being more efficient, this type of brake is stated to cause less wear on the rails than the magnetic type.

L.N.E. Railway.—COLOUR-LIGHT SIGNALLING.—Colour-light signalling and electrically operated points have been introduced on the recently widened section of the London and North-Eastern Railway between York and Northallerton. Four new signal boxes have been constructed and seven old ones abolished.

Communications

Australia.—BROADCASTING.—Since the Australian Broadcasting Commission was established eleven months ago listeners' licences have increased by 85,000. The Australian Broadcasting Co. has purchased Radio Broadcasting, Limited, and has thus become the sole owner of the "B" class station "2UW." The company, which conducted the national service under contract to the Commonwealth Government from 1929 to 1932, has kept its executive organisation intact throughout Australia, preparing for its advent into the "B" class broadcasting field. The purchase of "2UW" is the first step in organising an Australian-wide broadcasting circuit, which will be operated on lines similar to the former national service organisation of the company. Other associations will be announced shortly, extending the company's operations to other States. The company was formed four years ago and relinquished control of the national service when the Commission took its place on July 1st, 1932.

Denmark.—NEW KALUNDBORG BROADCASTER.—Novelty of design characterises the new high-power broadcasting station formally opened at Kalundborg on July 18th to replace the 10-kW station installed there some six years ago. It will operate on 1,260 metres with a tenfold increase in power. Hitherto it has been customary to build transmitters as a number of factory-made units, but at Kalundborg all high-



The new broadcasting equipment at the Kalundborg (Denmark) station which was put into service last week

power equipment has been built into a line of cubicles forming part of the building, giving a layout which is symmetrically balanced and stable from the electrical viewpoint, while from the mechanical aspect it is robust, well protected, and yet easy of access for maintenance purposes. The last amplifier stage is equipped with 200-kW water-cooled valves, of an entirely new type, operating with a plate supply of 20,000 V. This supply is obtained from a rectifier using twelve hot-cathode mercury vapour rectifier valves; the rectifier is claimed to be the largest of its kind yet put into commercial service. The aerial system is also abnormal, being of the "multiple-tuned" type with two down-leads individually tuned; this arrangement has been adopted in order to secure the maximum efficiency without the use of the very high masts which the long wavelength would otherwise demand. Crystal control is used to stabilise the wavelength. The equipment is of entirely British design, and was manufactured by Standard Telephones & Cables, Ltd., at its Hendon works, and installed by its engineers.

Great Britain.—RADIO RELAY SERVICES.—The Chatham Town Council has consented to the establishment of a service by Wireless Relay Services, Ltd.

Mr. A. W. Matthews, of Cambridge, who applied to the Linton Rural District Council for permission to establish a relay service in its area, has been informed that the matter concerns the County Council, and not the Rural Council.

The Whitehaven Town Council has granted permission to Mr. Robert Leslie to operate a service in the borough.

The Bournemouth Corporation Highways Committee has decided not to entertain proposals for the placing of wires across public highways.

The Lowestoft Corporation has received a protest from tenants of Corporation houses in Minden Road against the fixing to their houses of wires in connection with a broadcast relay service, and the Corporation has decided to inform Home Radio (Lowestoft), Ltd., that in the cases of Corporation houses, in addition to obtaining permission from the borough surveyor, it must obtain the consent of the tenant before fixing wires to premises.

POST OFFICE REVENUE.—A provisional financial statement based on the P.O. commercial accounts shows that during the year 1932-33 the deficit on the telegraph service reached £876,000, an increase of £66,426. The surplus on the telephone service amounted to £562,000, which is £9,848 less than in 1931-32.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Posts and Telegraphs Department. September 5th. Telephone instrument cords. (A.Y. 11878.)* Telephone switchboard cords. (A.Y. 11879.)*

September 19th. Telephone transmitters and parts. (A.Y. 11903.)*

September 12th. Four radio broadcasting stations at Townsville, Grafton, Sale and Launceston. The first two are to have an initial power of 5 kW each, with an ultimate power of 20 kW, while the others will have initial and ultimate powers of 2 and 10 kW.—*Tenders.*

August 8th. Telephonists' telephones and associated parts. G.P.O., Melbourne.

September 12th. Telephone switchboard plugs (A.Y. 11880)* and condensers (A.Y. 11895.)*

August 29th.—Radio measuring equipment. (A.Y. 11885.)*

September 9th (extended from August 18th). State Electricity Commission. Paper and varnished-cambric insulated and lead-covered and steel wire armoured cable. Mr. W. J. Price, secretary, Electricity Commission, 22-32, William Street, Melbourne.

August 21st. Power, telephone and pilot cables. (A.Y. 11877.)*

August 14th. City Council. Fibre or glazed stoneware conduits. City electrical engineer (deposit £1 1s.).

Belgium.—BRUSSELS.—August 4th. Hotel de Ville. Cables required by the Electricity Department until March 31st, 1934. Particulars for 10 fr. from the Service de l'Electricité, 11, Rue Ste. Catherine.

Boston.—August 22nd. Corporation. Electrically driven centrifugal sewage pumps. Borough surveyor (deposit £5).

Dagenham.—July 31st. Urban District Council. Electrically driven vertical centrifugal pumping set. Engineer and surveyor, Council offices (deposit £2 2s.).

Fife.—July 31st. County Council. Various works, including electric lighting, at sixty houses. Schedules from Messrs. C. R. Douglas & Son, surveyors, Dunfermline (deposit one guinea). Offers to J. M. Mitchell, county clerk, Cupar.

Glasgow.—July 28th. Corporation. Education Department. Electrical work at temporary school, Wyndford, Maryhill. Specifications, &c., from Education Offices (deposit one guinea). Offers to Town Clerk.

India.—SIMLA.—August 1st. Indian Stores Department. Two 75-kW motor-generator sets; 5-kW booster; switchboard. (A.Y. 11881.)*

London.—ISLINGTON.—August 9th. Electricity Department. H.p. switchgear and other accessories. (June 30th.)

Manchester.—August 9th. Rivers Committee. Electrical equipment, including l.p. switchboard, lighting and power installation and cable work, for the Davyhulme sewage works extension. (July 21st.)

New Zealand.—WELLINGTON.—September 12th. Posts and Telegraph Department. Battery plates. (A.Y. 11898.)*

Plymouth.—August 19th. Corporation. Distribution switchgear and battery-charging equipment for the mental hospital, Blackadon, Devon. (See this issue.)

Portsmouth.—August 19th. Electricity Department. (a) Steel air ducts for generating station and (b) construction of overhead e.h.p. and l.p. lines near Wickham. (See this issue.)

Portuguese East Africa.—LOURENCO MARQUES.—August 25th. Port and Railway Administration. Five floodlighting projectors (8,800 c.p. each). (A.Y. 11850.)*

September 22nd. Cable, connecting boxes and terminal boxes. (A.Y. 11909.)*

Rosslynlee (near Edinburgh).—August 26th. Midlothian and Peebles District Asylum Committee. Removal of existing steam and electrical generating plant and supply and installation of new power plant. (See this issue.)

South Africa.—CAPETOWN.—August 30th. Electricity Department. Oscillograph. &c. (A.Y. 11859.)*

September 27th. 20-h.p. motor-alternator set for meter testing. (A.Y. 11896.)*

August 16th. 5,000 25-A single-pole ironclad service cut-outs. (A.Y. 11893.)* Overhead line material and street lighting spares. (A.Y. 11892.)*

JOHANNESBURG.—August 2nd. City Council. 10,000-kW steam turbo-alternator and condensing plant. (A.Y. 11876.)*

August 17th. Ten miles of bare copper cable for overhead transmission lines. (G. 12737.)* Thirty miles of braided copper conductors for overhead transmission line. (A.Y. 11894.)*

PRETORIA.—August 18th. Government Supplies Board. Thirty-seven stationary batteries. (A.Y. 11902.)*

ROBERTSON.—August 23rd. Town Council. 200-kW turbo-alternator set, converting equipment switchgear, cables, overhead line material, transformers, meters, motors and fans. (A.Y. 11904.)*

DURBAN.—September 29th. Town Council. Twenty-two double-deck trolley-buses. Messrs. Webster, Steel & Co., 9, St. Helen's Place, Bishopsgate, London, E.C.3 (deposit £3 3s.).

Turkey.—ISTANBUL.—August 16th. Department of Posts, Telegraphs and Telephones. Iron telegraph wire. (G.Y. 12748.)*

August 19th. 60 tons of copper wire and 5,000 copper sleeves. (G.Y. 12747.)*

Wigton (CUMBERLAND).—Wigton Co-operative Society. Installation of electricity in a shop and dwelling house.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Durham.—County Education Committee. Accepted. Installation of electric lighting at the Seaham Harbour Carr House Estate Council School (£168).—H. A. Davie, Ltd.

Faversham.—Town Council. Accepted. Wiring fifty houses under the assisted wiring scheme (18s. 6d. per point for four lights, 18s. per point for five lights, and 17s. 6d. per point for six or more lights, and 19s. per power point).—F. B. Pordage. Feeder pillar (£73).—W. T. Henley's Telegraph Works Co., Ltd.

Government Contracts.—The following contracts were placed by the various Government departments during June:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Electric cable.—Anchor Cable Co.; B. I. Cables; Derby Cables; Ediswan Cables; Enfield Cable Works; G.E.C.; Greengate & Irwell Rubber Co.; W. T. Glover & Co.; Hackbridge Cable Co.; Henley's; Hooper's Telegraph & I. R. Works; Johnson & Phillips; Mersey Cable Works; St. Helens Cable & Rubber Co.; Siemens Electric Lamps & Supplies.

W/t coils.—Radio Instruments; H. W. Sullivan; Johnson & Phillips; Marconi's.

Oil-engine driven generating sets.—Ruston & Hornsby.

Tuner amplifiers.—H. W. Sullivan.

WAR OFFICE.

Inert cells.—Edison Swan Electric Co.

AIR MINISTRY.

Accumulators.—Edison Swan Electric Co.; C. A. Vandervell; Oldham & Sons; Peto & Radford.

Electrically heated clothing.—Dowsing Radiant Heat Co.; Siebe Gorman & Co.

Electric fuses.—Vickers-Armstrongs.

Transmitter-receiver.—Gramophone Co.

W/t valves.—A. C. Cossor.

CROWN AGENTS FOR THE COLONIES.

Cable.—Callender's; Standard Telephones.

Insulators.—Bullers.

Wire.—T. Bolton & Sons.

Wireless materials.—Marconi's.

POST OFFICE.

Telegraphic apparatus.—Creed & Co.

Telephonic apparatus.—Ericsson Telephones; Siemens Bros.; Standard Telephones; Telephone Mfg. Co.

Testing and protective apparatus.—Phœnix Telephone & Electric Works.

Wireless apparatus.—Radio Instruments.

Cable.—Connollys (Blackley); Henley's; Siemens Bros.; United Telephone Cables.

Leclanché cells.—Atlas Carbon & Battery Co.; Ediswan; Ever Ready Co.; Fuller Accumulator Co.; G.E.C.; Siemens Bros.

Secondary cells and parts.—Accumulators of Woking.

Electric clocks.—Automatic Electric Co.

Loading coils.—Siemens Bros.

Diaphragms.—Joseph Sankey & Sons.

Rectifier elements.—Westinghouse Brake & Saxby Signal Co.

Electric lighting fittings.—Venner Time Switches.

Meggers and cases.—Evershed & Vignoles.

Milliammeters.—E. Turner Elecl. Instruments.

Earth plates.—Bullers.

Electric battery trucks.—Greenwood & Batley.

Telegraph typewriters.—Imperial Typewriter Co.

Copper wire.—B. I. Cables; R. Johnson & Nephew; Nevill, Druce & Co.; R. H. Symonds.

Flameproof wire.—Concordia Electric Wire Co.; Reliance Elecl. Wire Co.

Insulated wire.—G.E.C.; Johnson & Phillips.

Reconditioning cable, Manchester-Warrington-Preston-Carlisle-Glasgow.—Standard Telephones.

L.p. cables, Mount Pleasant new letter office, E.C.—Elecl. Installations.

Telephone exchange equipment.—Crewe, Folkestone and Hampstead.—Ericsson Telephones. Western (London).—Siemens Bros. York, Metropolitan (London) and L.C.C. County Hall.—Automatic Electric Co. Kenton (Newcastle-upon-Tyne). Halifax and London (trunk).—Standard Telephones.

Telephonic repeater equipment. Leicester and Birmingham.—G.E.C.

Hastings.—Electricity Committee. Recommended. Two sets of surge absorbers (£211) and two 400-kVA transformers (£353).—Ferranti Ltd. Seventeen sets of auto-valve arrestors (£446).—English Electric Co., Ltd.

Baths Committee. Accepted. Electric boiler, &c., for bathing pool (£199).—W. H. Still & Sons, Ltd.

Kettering.—Electricity Department. Accepted. Transformer kiosk, including e.h.p. and l.t. switchgear, in connection with the Mill Road change-over (£213).—Ferguson, Pailin, Ltd. Two transformer kiosks, including e.h.p. and l.p. switchgear, for Wellard Park Road, Market Harborough, and Oakley Road, Corby (£192), and switching kiosk, including e.h.p. switchgear, for the Arthingworth e.h.p. line (£135).—A. Reyrolle & Co., Ltd.

London.—LEWISHAM.—Baths Committee. Recommended. Electric lighting installations at Ladywell baths (£110) and at Forest Hill Library (£78).—E. E. Dyne.

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Cables (£1,631).—Standard Telephones & Cables, Ltd. H.p. switchgear panel (£448) and switchgear (£532).—A. Reyrolle & Co., Ltd.

L.C.C. Central Public Health Committee. Accepted. Electrical installation at City of London Institution, Bow (£388).—J. Briggs, Electrical Contractors, Ltd. Electric fire alarm system.

Constance Road Institution, East Dulwich (£300).—Buchanan & Curwen, Ltd. Electric lighting installation in four wards at Eastern Hospital, Homerton (£355).—T. Clarke & Co., Ltd. Renewal of wiring and fittings for electric lighting, &c., at Highgate Hospital (£697).—A. Meckhonik. Wiring and fittings for alterations and additions to electric lighting, power, telephones, &c., in new messroom, High Wood Hospital, Brentwood (£295).—Phillips & Sons Electrical, Ltd. Electric passenger lift in the extension of the nurses' home at Mile End Hospital (£496).—J. Bennie, Ltd. Electrical installation in nurses' home extensions (£763).—T. Clarke & Co., Ltd. Electrical installation in the group pathological laboratory (£391).—Buchanan & Curwen, Ltd. Electrical installation in St. Charles Hospital, Ladbroke Grove (£512).—Electrical Installations, Ltd. Electrical installation at St. Pancras Hospital (£631).—J. Briggs, Electrical Contractors, Ltd.

STEPNEY.—Electricity Supply Committee. Recommended. Electric passenger lift at Limehouse power station (£456).—Marryat & Scott, Ltd.

Works Committee. Recommended. Traffic signals (£919).—Automatic Electric Co., Ltd.

Portland.—Electricity Committee. Accepted.—Cable for extension to houses at Weston (£75).—Hackbridge Cable Co.

Housing Committee. Accepted. Wiring thirty Council houses.—R. L. Weyman.

Wallasey.—Watch Committee. Accepted. Traffic signals (£200).—Chance Bros., Ltd.

Wrexham.—Rural District Council. Wiring twenty houses at Rhostyllen for electric lighting (£105).—Jones & Williams.

Notes

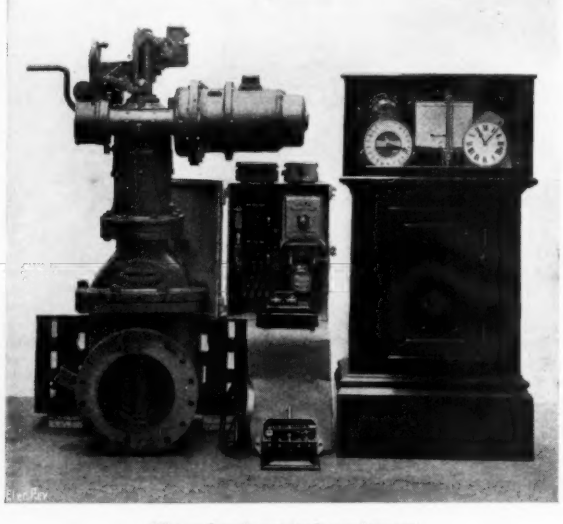
An Unusual Sub-station

The pictures on page 123 show a rather novel transformer station which stands in the centre of the court of Newquay House, Kennington, on the Duchy of Cornwall estate. The transformer is used for stepping down a supply received at 3,000 V from the South London Electric Supply Corporation for distribution in the buildings at 230 V. At present only lighting has been installed, but the conduit is available *in situ* for the accommodation of heating and cooking circuits at a later date.

In the walls of the sub-station are four sets of lighting panels each comprising three 60-W pearl "Osram" lamps and a "Holophane" prismatic glass front. The lighting, which is controlled by a Venner time switch, is put on at sunset and at midnight two of the lamps are switched off, leaving the centre one in each panel burning to be switched off at sunrise. These centre lamps are arranged to throw the light downward to illuminate the area around the sub-station; the other two lamps cast their light upon the surrounding courtyard. The electrical contractors for this work were Messrs. G. W. Franklin & Son, London, N.W.

Electrical Water-level Control

The electrical control of hydraulic apparatus has become so "foolproof" that few large hydraulic installations are now unprovided with this very practical means of remote control. Not only does the use of electricity facilitate the installation of sentinel apparatus for the progressive release of impounded water as the level rises in the reservoir but it also makes possible the control and operation of distant valves at a very considerable saving in cost of operation.



Water-level control equipment

A typical case of this nature was recently dealt with by Messrs. Glenfield & Kennedy, Ltd., for the Doncaster and Tickhill waterworks, the requirements being to operate a water level recorder and an electrically controlled sluice valve over one Post Office line wire forming also part of a telephone circuit. Actually the solution proved simple, consisting of a special type of switch to operate the valve through a relay, automatically and momentarily isolating the circuit of the water level indicator; similarly the valve circuit is isolated when the recorder receives an impulse. The valve and transmitter are housed in the Rossington water tower, which is about five miles from the Austerfield pumping station, at which the recorder and control are fitted. The accompanying picture shows the valve with operating gear, control apparatus, and also the electrical water level transmitter and recorder.

The Oil Exhibition

We saw a few items of electrical interest displayed at the International Oil Exhibition held at the Agricultural Hall, Islington, from July 19th to 25th. British Ropes, Ltd., showed a comprehensive range of overhead-line conductors, clamps, and connectors, some in conjunction with a model h.p. transmission line. Babcock & Wilcox, Ltd., demonstrated their exclusive system of fusion arc welding in connection with bubble towers and other pressure vessels employed by the oil industry. It was also shown how the company's electrically operated valves can be employed with remote control to prevent wastage of oil in the event of bursts in oil lines. George Kent, Ltd., had a display of instruments designed for the measurement of flow in pipes, and a recording potentiometer-type temperature controller. There was a wide range of electrical thermometers and pyrometers displayed by Negretti & Zambra, while the Yoxall Instrument Co. showed a new type of temperature controller of the recording type with rotating electrical contacts.

On the stand of Baird & Tatlock (London), Ltd., there was an improved model of the company's water still, the "Automatic Robot," fitted with a "Swan" kettle-type spring-loaded heat-fuse cut-out in the connector. The Alfa-Laval Co., Ltd., had on view several electrically driven centrifuges for refining and purifying petroleum products; and among various equipments for use in connection with oil refining displayed by A. Gallenkamp & Co., Ltd., we saw electrically heated flash-point apparatus, similarly heated viscometer equipment, motor-driven centrifuges for water and sediment measurement, and new electrically heated and driven apparatus for determining losses on heating in asphalts.

New German Express Locomotives

Trials of the new 2-6-2 electric express locomotives built for the German State Railways by the A.E.G., have shown remarkable results. These machines are designed for a maximum speed of 80.8 miles an hour with 324 tons coupled load, and 68.4 miles an hour with 649 tons coupled load on the level. The leading dimensions are as follow: Length over buffers, 49 ft. 10½ in.; diameter of driving wheels, 5 ft. 3 in.; diameter of carrying wheels, 3 ft. 3⅛ in.; weight in running order, 90 tons 1 cwt.; output one hour at 62.1 m.p.h., 2,960 h.p.; output continuous at 66.5 m.p.h., 2,764 h.p. A locomotive of this type hauled a train of seven corridor coaches from Munich to Stuttgart in 146 minutes net running time, reaching a maximum speed of 94.1 m.p.h. The train was accelerated from standstill to 68.4 m.p.h. in two and a half minutes. Further locomotives of the same type are to be placed in service on the Augsburg-Nürnberg line.

The Public Lighting Conference

The tenth annual meeting and conference of the Association of Public Lighting Engineers are to be held at Margate from September 4th to 6th, with headquarters at the Queen's Hotel. The programme is as follows:—

Monday, September 4th.—Evening civic reception at the Winter Gardens, followed by a cabaret and dancing.

Tuesday, September 5th.—Morning. Induction of new president, Mr. E. M. Severn, and delivery of his address; presentation of data on the lighting of Margate by Mr. H. V. Emptage, public lighting superintendent; paper on the lighting of seaside resorts by Mr. W. N. C. Clinch; luncheon as the guests of the Isle of Thanet Gas Light & Coke Co. Afternoon: Excursion to Canterbury, and paper by Mr. G. H. Wilson on gaseous luminous discharge lamps and their application to public lighting.

Wednesday, September 6th.—Morning: Annual meeting and transaction of formal business; paper on street lighting in the Irish Free State by Mr. F. X. Algar; Association luncheon. Afternoon: Paper on the public lighting of Paris by Mr. J. M. Partridge, chief engineer in charge of street lighting, Paris; paper on public lighting in Bombay by Mr. J. P. Blackmore.

Appointments Vacant

Assistant shift engineer for Hull Electricity Department.

Inspector for Guernsey Electricity Department. Also maintenance engineer for Guernsey Board of Administration.

District superintendent for Ayrshire Electricity Board.

Lady canvasser and demonstrator for Stoke-on-Trent Electricity Department.

Assistant lecturer and demonstrator in electrical engineering at Sheffield University.

Generating station engineer and steam operating engineer for Hackney Borough Council. (See our classified advertisements.)

Makers' Names Wanted

HERLA electric domestic appliances.
BOUDOIR carpet sweeper.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. E. Hughes, Ph.D., M.I.E.E., head of the Electrical Engineering Department of the Technical College, Brighton, has had the degree of D.Sc. in the Faculty of Engineering conferred upon him by the Senate of the London University.

Mr. J. M. Kennedy, M.Inst.C.E., M.I.E.E., of Messrs. Kennedy & Donkin, consulting engineers, has accepted the invitation to become president of the Association of Supervising Electrical Engineers. He will take office in October, succeeding Mr. G. Scott Ram, O.B.E., M.I.E.E., who has held the office of president for the past two years. Mr. Kennedy was educated at University College School and at Cambridge, and received his technical training with Messrs. Richard Moreland & Sons, Willans & Robinson, Ltd., and Siemens & Halske, Berlin. His firm has been responsible for numerous important electricity schemes in various parts of the world, its more recent work including the scheme for the supply of electricity in a large area of Northern Ireland. Mr. Kennedy, who is vice-president of the Institution of Electrical Engineers, will be introduced at the opening meeting of the 1933-34 session of the Association to be held on October 17th, when he will deliver his presidential address.

[Elliott & Fry

Mr. J. M. Kennedy

Mr. H. S. Ingleby, formerly with Messrs. Scattergood & Johnson, Ltd., has been appointed district representative in the Leeds and Wakefield areas for Messrs. J. Dyson & Co., Ltd., of Bradford.

Mr. A. G. Foster, M.I.Mech.E., has been appointed general sales manager to Messrs. Kryn & Lahy (1928), Ltd., and Messrs. Browett-Lindley (1931), Ltd., have entered into an arrangement with Messrs. Kryn & Lahy for the sale of their engines, compressors, condensing plant, &c., to be conducted by Mr. Foster.

Marchese Marconi is starting on a new cruise in his steam yacht *Elettra* for the purpose of carrying out further experiments in the transmission and reception of micro-waves. In addition to repeating and checking his long-distance tests of last year, when micro-wave signals were transmitted and received over the record distance of 168 statute miles, Marchese Marconi has planned a new series of investigations into the propagation properties of these waves.

Mr. E. W. Dickinson

Mr. E. W. Dickinson, M.I.E.E., has resigned his appointment as personal assistant to Sir John Snell, chairman of the Electricity Commission, on account of ill-health. He is leaving the service of the Commission at the end of this month. Born in 1872 at Ulverstone, Lancs, Mr. Dickinson was educated at the Manchester Grammar School and Bradford Technical College. He subsequently served an apprenticeship with Mr. J. H. Rider in Halifax. He was with the Corlett Electrical Engineering Co., in 1893, and in the following year went to Bolton as assistant engineer at the Corporation Electricity Works. He left Bolton in 1896 to become engineer and manager of the Trinidad Electric Lighting & Power Co., and two years later joined the British Electric Traction Co. as chief assistant power engineer, subsequently becoming chief assistant to the consulting engineer and rolling stock engineer. He joined the L.C.C. Tramways Department in 1903, and resigned from the position of power station engineer in 1924 to engage in private practice. He went to the Electricity Commission in 1926.

Mr. Ll. B. Atkinson has been elected chairman of the Joint Industrial Council for the Electric Cable Making Industry for the ensuing year, and **Alderman E. Porter** has been elected vice-chairman.

Mr. W. T. Bottomley, associate member of the North East Coast Institution of Engineers & Shipbuilders, has been awarded the Institution Gold Medal for a paper entitled "Radiation in Boiler Furnaces" read in January last. Mr. Bottomley is a member of the technical staff of Messrs. Merz & McLellan, Newcastle-upon-Tyne. The Council has also made awards to the following graduate members for papers read during the current session:—Messrs. W. Spencer Paulin, A. T. S. Sheffer, L. P. Gibson, N. Milne Hunter, S. G. Irving, J. C. Dixon, A. Hendry, L. H. W. Wright and N. H. Denholm.

London Passenger Transport Board.—With a view to securing that the services of the London Passenger Transport Board shall be properly co-ordinated with the suburban passenger services of the four main line railway companies, the London Passenger Transport Act, 1933, provides for the establishment of a Standing Joint Committee. This Committee has now been set up, as follows: Members appointed by the Board: Lord Ashfield, Messrs. Frank Pick and P. Ashley Cooper, and Brig.-Gen. Sir Henry P. Maybury. Members appointed by the main line railway companies: Sir Josiah Stamp (London, Midland and Scottish Railway), Sir Ralph L. Wedgwood (London and North Eastern Railway), Sir James Milne (Great Western Railway), and Sir Herbert A. Walker (Southern Railway). Lord Ashfield has been appointed chairman of the Committee and Sir Josiah Stamp deputy chairman.

Mr. [illegible] W. Beuttell, consulting engineer for the illumination of the Masonic Peace Memorial described on page 122

Mr. C. F. Partridge is recommended by the Birmingham Education Committee for the appointment as head of the Electrical Engineering Department of the Central Technical College. Owing to ill-health Mr. W. Brew will retire at the end of August. The commencing salary will be at the rate of £570 per annum, rising by annual increments of £30 to a maximum of £720 per annum, less 10 per cent. Mr. Partridge, who is forty years of age, was engaged as chief lecturer in electrical engineering at the Leeds Technical College from 1923 to 1925, and from 1925 to the present date he has held the appointment of head of the Electrical Engineering Department at Leeds.

Obituary

Dr. H. de Forest Arnold.—The death occurred in New York on July 10th of Dr. Harold de Forest Arnold, director of research at the Bell Telephone Laboratories. Dr. Arnold studied under Prof. R. A. Millikan, and entered the Research Laboratories of the Bell System in 1911. His contributions to knowledge have been in the field of telephone transmission, thermionics and magnetics. In the subject of thermionics he was one of the earliest scientific workers and was the first to appreciate the necessity for a high vacuum in the three-element thermionic tube; he developed designs for vacuum tubes and methods for their manufacture. He was also responsible for the development in the Bell Telephone Laboratories of the magnetic alloys, permalloy and perminvar. Dr. Arnold was a member of the Franklin Institute, the the American Association for the Advancement of Science, the American Institute of Electrical Engineers and other American Societies.

The late Dr. H. de Forest Arnold

Mr. L. A. O'Brien.—The death occurred on July 22nd, after a short illness, of Mr. Louis Adolphe O'Brien, of Messrs. O'Brien & Hulme, wholesale electrical suppliers, of Manchester. The interment took place on July 25th at Wilmslow Cemetery.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Poole Rediffusion Service, Ltd.—Private company. Registered July 10th. Capital, £100 in £1 shares. Objects: To establish, maintain, and develop a service for the relaying of wireless and radio entertainment programmes to subscribers and others in Poole and the neighbourhood thereof, and to adopt an agreement dated July 11th, 1932, between the Borough of Poole and Rediffusion, Ltd., of Bush House, Aldwych, W.C.2. The directors are: W. W. Wakefield, 6, St. James Terrace, Regent's Park, N.W.8; and C. Whitcroft, Inglewood, New Wanstead, Essex. Secretary: C. Whitcroft. Registered office: Bush House, Aldwych, W.C.2.

Beaver Radio (Manchester), Ltd.—Private company. Registered July 13th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio and telephonic receiving apparatus and component parts, gramophones and sound-reproducing machines, &c. The first directors are: P. E. Beaver, 27, Grove Park, Liverpool, and G. J. Long, 50, Grove Street, Liverpool. Registered office: 81b, Mosley Street, Manchester.

Home Radio and Television, Ltd.—Private company. Registered June 22nd. Capital, £300 in £1 shares. Objects: To acquire the business of radio and electrical engineers carried on by Patrick Fallon and James Fallon at 260, London Road, Mitcham, Surrey. The permanent directors are: P. Fallon, 376, Brigstock Road, Thornton Heath, and J. Fallon, 6, Polstead Road, Catford, S.E. Registered office: 376, Brigstock Road, Thornton Heath, Surrey.

T. J. Donald & Co., Ltd.—Private company. Registered June 16th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical and wireless engineers, contractors and manufacturers, &c. The directors are: I. E. Donald, 1, Courthigh Gardens, N.W.11; A. Hirst, Hirsts Motors, Armitage Road, N.W.11; and T. J. Donald, address not stated. Registered office: 6, Hallswelle Parade, Temple Fortune, N.W.11.

Bathe Brothers, Ltd.—Private company. Registered, June 26th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and sellers of suction cleaners and other domestic labour-saving apparatus and appliances. The permanent directors are: A. Bathe, C. Bathe, and R. J. Bathe, all of 21, Vallance Road. Registered office: 115, High Holborn, W.C.1.

C. B. O. Ltd.—Private company. Registered June 28th. Capital, £500 in £1 shares (100 5 per cent. cumulative preference and 400 ordinary). Objects: To carry on the business of radio engineers and contractors, &c. The directors are: A. Veitch, 29, Albany Mansions, Albert Bridge Road, S.W.11; J. S. Pritchard, 58, Hilltop, N.W.11; and E. W. Vernally, Terrace Villa, Brentwood. Registered office: 35, Bucklersbury, E.C.4.

Universal Signs, Ltd.—Private company. Registered July 3rd. Capital, £500 in £1 shares. Objects: To acquire an invention relating to an advertising sign protected in the U.K. and Isle of Man under pending patent application No. 22687/31, to manufacture and sell the said advertising sign and to carry on the business of sign makers, &c. The subscribers are: A. P. Kelday and Wm. Leckie, both of 52, New Broad Street, E.C. Registered office: 36a, Wood Street, E.C.2.

John T. Nichols, Ltd.—Private company. Registered July 14th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio sets and apparatus, accumulator chargers, electrical fittings, &c. The directors are: John T. Nichols, West Mersey; F. W. Swift, The Brents, Chelsfield, Kent, and Philip G. Watkins, 34, Grand Avenue, Muswell Hill.

Scarborough Relay Services, Ltd.—Private company. Registered July 13th. Capital, £6,000 in £1 shares (3,000 8 per cent. cumulative preference and 3,000 ordinary). Objects: To carry on business as electrical, radio and general engineers, relayers of wireless entertainments and programmes, &c. The permanent directors are: Henry A. Close, "Uplands," Manygates Lane, Sandal, Wakefield, and S. Flowitt, 8, Windsor Road, Doncaster. Registered office: 28, Falsgrave Road, Scarborough.

Camberwell Relay Service, Ltd.—Private company. Registered July 14th. Capital, £5,000 in £1 shares. Objects: To construct and maintain broadcasting and other stations, exchanges and lines for the reception or distribution of radio signals, &c. The permanent directors are: Samuel F. Youles, Waterloo House, Waterloo Street, Hove; Wm. J. Jennings; Wm. H. Graham; Aubrey R. Hunt, Newlyn Croft, Mill Road, Burgess Hill (managing director).

Hants Relay, Ltd.—Private company. Registered July 15th. Capital, £9,000 in 8,000 7 per cent. cumulative preference shares of £1 each and 20,000 ordinary shares of 1s. each. Objects: To adopt an agreement with E. Wyatt to establish wireless stations, to relay wireless or radio signals and broadcast programmes, &c. The directors are: E. A. Wyatt, 10, Queen's Road, Buckland, Portsmouth, and L. F. Glanville, 16, Landport Terrace, Portsmouth. Registered office: 10, Queen's Road, Buckland, Portsmouth.

Dicona, Ltd.—Private company. Registered July 31st. Capital, £3,000 in £1 shares. Objects: To acquire any inventions, patents, patent rights, *brevets d'invention*, secret processes, licences or concessions relating to the production, reproduction or diffusion of light, heat, sound, power or wireless waves, and to carry on the business of electrical, experimental, and general engineers, &c. The directors are: E. J. Knight (permanent managing director and chairman), Apsley House, 4, Vernon Street, Derby; C. J. Owen, 1, Matlock Place, Cheam, Surrey; and J. Q. M. Langstaffe, address not stated.

Aladdin Radio Industries, Ltd.—Private company. Registered July 22nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in radio, sound receiving, recording and transmitting, electrical and other apparatus, &c. The directors are: J. Imber, Aladdin Building, Greenford, Mddx. (director, Aladdin Industries, Ltd.); V. S. Johnson, address not stated; E. I. Allen, "Copsefield," Woodford Road, South Woodford, E.18 (director, Aladdin Industries, Ltd.). Solicitors: Walbrook & Hosken, 4, St. Paul's Churchyard, E.C.4.

Drake & Gorham Electrolumination, Ltd.—Private company. Registered July 21st. Capital, £200 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, manufacturers and workers of and dealers in electricity, gas, gas and electric signs, motive power and light, &c. The directors are: H. W. Scutts, Blenheim, Lees Road, Bramhall, Ches (director, Drake & Gorham, Ltd.); R. J. Weil, Latimore House, Maidenhead (director, Commercial Credit Co., Ltd.). Secretary F. E. Metters. Registered office: 36, Grosvenor Gardens, S.W.1.

Keighley's (Lifts and Motors), Ltd.—Private company. Registered July 21st. Capital, £1,025 in 2,000 "A" shares of 10s. and 6,000 "B" shares of one penny each. Objects: To carry on the business of electrical engineers, &c. The directors are: W. A. Benger, Friarswood, Wilton Road, Ilkley, Yorks; and three others. Registered office: 13, Victoria Street, S.W.1.

Bath Engineering Co., Ltd.—Private company. Registered July 18th. Capital, £500 in £1 shares. Objects: To carry on the business of general and electrical engineers, &c. The permanent directors are: E. G. Matthews, 54, Shakespeare Avenue, Wellsway, Bath; and B. C. Matthews, Old Red Lion Cottage, Odd Down, Bath. Secretary: Doris Matthews. Registered office: 5, Wells Road, Bath.

Blue Spot Radio, Ltd.—Private company. Registered July 21st. Capital, £100 in £1 shares. Objects: To carry on the business of agents for the sale and distribution of radio gramophones, radio receivers, &c. The subscribers are: H. C. Martin, 32, Westbourne Park Villas, Bayswater, W.2; and K. A. Whetham, Ashdown, Burgess Hill, Sussex. Secretary (pro. tem.): H. C. Martin. Registered office: Devereux Chambers, Temple, W.C.2.

Atozed (Kingston), Ltd.—Private company. Registered July 18th. Capital, £300 in £1 shares. Objects: To carry on the business of electric sign and lighting specialists, manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, &c. The directors are: J. A. Gould, 5, Hampton Court Road, Hampton Wick, and O. M. Davey, 105, Aurelia Road, Croydon. Registered office: 20, Budge Row, E.C.4.

Geo. Cooper (Electricians), Ltd.—Private company. Registered July 18th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, electricians, &c. The directors are: Geo. Cooper (permanent managing director) and Mrs. Florence J. Cooper, both of 104, Drummond Road, Skegness. Solicitors: F. Allcock, 32, Bridlesmith Gate, Nottingham.

Excel Electrical Equipment Co., Ltd.—Private company. Registered July 17th. Capital, £3,000 in £1 shares. Objects: To carry on the business of manufacturers of electrical heating apparatus, electrical and refrigerating engineers, and fitters, electrical furnishers, &c. The first directors are: M. Bryan, "Algonquin," Mallory Road, Hove, and R. S. Keith, Green Hedges, Haywards Heath. Registered office: Adelaide House, King William Street, E.C.4.

Bective Electrical Co. (Ireland), Ltd.—Private company. Registered in Dublin, July 14th. Capital, £4,000 in 1,500 "A" shares of £1 each and 5,000 "B" shares of 10s. each. Objects: To carry on the business of manufacturing construction and/or consulting electrical, gas, hydraulic, mining, civil, marine, and mechanical engineers, &c. The subscribers are: The Earl of Bective, Virginia Park, Virginia, Co. Cavan, electrical engineer, and R. J. Leonard, "St. Kevins," Darty Road, Rathmines, Dublin. Solicitor: Arthur Cos, 42-3 Stephen's Green, Dublin.

T. G. Brunskill, Ltd.—Private company. Registered July 20th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and retailers of and dealers in all forms of radio apparatus and accessories, wireless, electrical, automobile and general engineers, to carry on any business under hire-purchase agreements, &c. The directors are: Thomas G. Brunskill and Emily L. Brunskill, both of St. Aubins, 244, Old Bath Road, Cheltenham. Registered office: Radio House, 9, Albion Street, Cheltenham.

Returns of Electrical Companies

John Bennie, Ltd.—Satisfaction on July 11th of mortgage dated June 12th, 1933, and registered June 15th, 1933. (According to the register of mortgages, the mortgage registered June 15th, 1933, originally secured £2,100.)

Mortgage dated July 12th to secure £1,500, charged on certain specified debts, and sums due or to become due under certain contracts. Holder: T. W. Hayes, 31, Bracken Gardens, Barnes, S.W.

St. Austell and District Electric Lighting and Power Co., Ltd.—The nominal capital has been increased by the addition of £20,300 beyond the registered capital of £40,000. The additional capital is divided into 7,000 7 per cent. cumulative preference and 13,300 ordinary shares of £1 each.

British Ensign Engineering Co., Ltd.—H. Kidson, 45, Kingsway, W.C.2, ceased to act as receiver and manager on July 13th.

Hexham and District Electric Supply Co., Ltd.—Satisfaction in full on various dates from April 4th, 1928, to June 30th, 1933, of mortgage and debenture both dated February 24th, 1922, and registered March 9th, 1922, securing £23,000.

Wholesale Electrical Supplies (Salford), Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £1,000. The additional capital is divided into 2,000 5 per cent. preference shares of £1 each.

New Phonopore Telephone Co., Ltd.—H. D. Sprague, 61 & 62, Chancery Lane, W.C.2, was appointed receiver of the rents and profits of the freehold premises comprised in an indenture dated November 14, 1911, by Order of Court dated June 13th, 1933.

Ionlite, Ltd.—Two debentures dated June 22nd, and July 6th, 1933, to secure £1,000 each, charged on the company's property, present and future, including uncalled capital. Holder: H. C. Vereker, 6, Manor Hall Avenue, N.W.4.

Synchromatic Time Recording Co., Ltd.—Particulars filed of £1,000 debentures authorised July 8th, 1933, charged on the company's undertaking and property, present and future, including existing contracts, yearly rentals, hire and hire-purchase agreements, and all goods secured under existing contracts and agreements, and unpaid capital, the whole amount being now issued.

Supra Electra Motors, Ltd.—Issue on July 6th, 1933, of £200 debentures, part of a series already registered.

"New Era" Time & Telephone Systems, Ltd.—Two mortgages dated June 29th, 1933, to secure £128 18s., and £136 19s. 3d., charged on contracts for the purchase or hire of telephone installations, and company's property and estate therein, &c. Holders: New Era Installation Trust, Ltd., 30, St. Ann Street, Manchester.

Elgee Manufacturing Co., Ltd.—Particulars filed of debentures not exceeding £500 authorised June 16th, 1933, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £100.

Northleach Electric Supply Co., Ltd.—Capital, £3,000 in £1 shares. Return dated May 29th, 1933. 2,195 shares taken up. £2.245 paid (including £50 paid on 100 forfeited shares). Mortgages and charges, nil.

Truro Electricity Supply Co., Ltd.—Capital, £20,000 in £1 shares. Return dated May 13th, 1933. 15,000 shares taken up. £15,000 paid. Mortgages and charges, nil.

Anglo-Portuguese Telephone Co., Ltd.—Capital, £1,100,000 in 1,000,000 ordinary and 100,000 "A" ordinary shares of £1 each. Return dated April 12th, 1933. 766,092 ordinary and 100,000 "A" ordinary shares taken up. £567,573 paid on 567,573 ordinary shares, £298,519 considered as paid on the remainder. Mortgages and charges: £325,405.

British Thomson-Houston Co., Ltd.—Capital, £4,000,000 in 2,000,000 7 per cent. cumulative preference and 2,000,000 ordinary shares of £1 each. Return dated April 10th, 1933. 1,500,000 preference and 2,000,000 ordinary shares taken up. £3,425,310 paid, £74,690 considered as paid. Mortgages and charges: £1,475,516.

British Insulated Cables (S.A.), Ltd.—Capital, £2,000 in £1 shares. Return dated February 23rd, 1933. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Radio Retailers, Ltd.—S. G. Crimes, 150, Southampton Row, W.C.1, ceased to act as receiver on May 31st, 1933.

Marlborough Radio Co., Ltd.—Debenture dated June 28th, 1933, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: B. H. M. Worswick, "Westlands," Whalley Road, Padiham, Lancs.

Electrical Contracts & Maintenance Co. (1925), Ltd.—Capital, £3,000 in £1 shares. Return dated May 8th, 1933. 2,405 shares taken up. £2,405 paid. Mortgages and charges, nil.

Watson & Henderson, Ltd.—Particulars filed of £6,000 debentures authorised June 28th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £4,000.

Super Radio Co. (Bradford), Ltd.—Debenture dated June 26th, 1933, to secure £9,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: B. Freeman, Nunwood, Apperley Bridge, Yorkshire.

City Notes

Petters, Ltd.—Presiding at the annual meeting held on July 18th, Sir Ernest W. Petter (chairman) said that last year he pointed out the difficulty which faced them due to the great reduction in export trade. The depression prevailed during the whole of the trading year under review with increasing intensity, and although at the present time there were some signs of improvement, the situation was still far from being normal. It was unfortunate that at a time when a business of this character was experiencing a depression in export trade, the home trade should be reduced by Government interference. One of their principal sources of business in this country in the past had been the provision of motive power for town and village lighting and for factory requirements. They now had to meet in a very intensified form the competition of the grid system. This was often unfair in that when they quoted for installations, special reductions in prices much below the cost of production and distribution were frequently made by the public authority concerned, and, in consequence, the business was lost to them. They had now the additional difficulty of an *ad valorem* duty of approximately 30 per cent. placed upon the fuel used by their engines. Their aircraft department had also been very poorly employed. They had been encouraged by the adoption of their civil aircraft, but requirements for this purpose did not make up for the very severe reduction in Air Ministry orders. Regarding the future, since the close of the financial year there had been a marked improvement in the inquiries which they had received, and also in orders, although not sufficient to enable him to predict with confidence that the end of the depression was in sight.

W. & T. Avery, Ltd., held their annual meeting on July 25th, when Sir J. Fortescue Flannery (chairman), who presided, said that it would be a matter of surprise to shareholders and the public if their company, which manufactured or traded in practically every one of the principal foreign countries, should not have suffered by the upheavals and chaos throughout Europe, but by careful management they had weathered the storm. The past year was notable for an intensification of the difficulties of the preceding year or two, and in certain markets, temporarily, the demand for their machines did not exist and no price reductions would meet the case. At home, the decreased purchasing power, due to unemployment, &c., had not been without its effect upon their business, but they had been able not only to increase their efficiency in manufacture and maintenance, but to carry out active development work, and to bring about such improvements in their manufactures and in their sales organisation, that their company stood to-day higher in industry than it ever did. They had secured a greater proportion of such business as was to be had than ever before. Their shopfitting business of Parnell & Sons, Ltd., Bristol, was still progressing, while Avery-Hardoll, Ltd., was also doing well, its electric meter pump for quick garage service proving popular and efficient.

United Water Softeners, Ltd., reports a net profit for 1932 of £521, as compared with £1,837, including special reserve of £830 written back in the preceding year. To this is added £2,271 brought in, making £2,792. The preference dividend is paid and £172 is carried forward. No dividend is paid on the ordinary shares; the last distribution was 7½ per cent., less tax, for 1930. The directors state that the turnover for the first six months of the current year showed improvement, but in view of the results for 1932 it is proposed to defer the current year's preference dividend.

The Torquay Tramways Co., Ltd., has announced that in view of the early probable change-over to motor omnibuses, it has decided to defer consideration of an interim dividend until September. Last year an interim dividend of 4 per cent., tax free, was paid.

The City of Oxford and District Tramways Co. reports a profit for the year ended March 31st last of £4,755, as compared with £4,212 in the preceding year, to which is added £1,119 brought in. A further dividend of £3,135 has been received from the Oxford Tramways Syndicate since the accounts were completed. A final dividend of 19s. per share is paid (same). A capital bonus of 4s. was paid in July, 1932, and a dividend of 12s. in December last. In all 35s. was paid in 1931-32.

The American Telephone & Telegraph Co. reports a net income for the six months ended June 30th of $66,114,509, as against $75,290,881 in the corresponding period of 1932, which is equivalent to $3.54 per share (against $4.03). These earnings include dividends declared by associated companies which were not fully earned during the six months by about $12,803,000 (against $7,800,000), and do not reflect the current deficit of the Western Electric Co. Dividends declared during the half-year absorbed $83,980,237 (against $83,974,366).

The Metropolitan Electric Supply Co., Ltd., has declared an interim dividend at the rate of six per cent. per annum in respect of the half-year ended June 30th.

The London Electric Supply Corporation, Ltd., has announced an interim ordinary dividend at the rate of 6 per cent. per annum, less tax, for the half-year ended June 30th last.

The Charing Cross Electricity Supply Co., Ltd., has declared an interim dividend of 3½ per cent. on the ordinary shares (same).

Mather & Platt, Ltd., have announced an ordinary interim dividend of 2½ per cent., less tax (same).

Stocks and Shares

TUESDAY EVENING.

A WILD orgy of gambling by New York speculators culminated, last week-end, in a sudden collapse of the upward movement, and a violent deflation of prices. The gamble was by no means confined to stocks and shares. It embraced commodities, rubber and base metals. The rate of exchange, which stood at 3.20 a few months ago, rose to the par of 4.86. In this depreciation of the dollar, American investors, as distinct from the gamblers, saw such menace to their currency as frightened them. They took British industrial shares in both their hands. The consequence is seen in the high prices which the shares in most British trading companies have reached. The gambling movement, it was mentioned here last week, had become somewhat dangerous. Hastily conceived plans for putting on the brake from Washington, had a spectacular effect. Prices fell heavily. The New York Stock Exchange and some of the other American exchanges, took alarm and decided to curtail, this week, their business hours from five to three. The repercussion of the slump was felt almost everywhere, either directly or indirectly. Calm, as usual, succeeded storm. Recovery set in, caused by bargain-hunting, and much of the previous loss was regained.

Electricity Supply

One of the very few markets which the American semi-panic did not affect was that for electricity supply shares. It comes well within recent memory to recall how American interests bid for control of the electricity in this country. Through the Greater London and Counties Trust and other companies, the Americans endeavoured to obtain a secure foothold. They were declared to have taken large lines of shares in several of the leading British undertakings, including the General Electric Co., Ltd. The aim of obtaining control became frustrated, and in the 1929 American slump, a good many British shares which the U.S.A. had previously bought, came back to this country. No doubt the American influence is still considerable in several of these cases, but the frenzied financial operations in New York during the present month have left unscathed the prices of British electricity supply shares. The matter is worth mentioning at this length—were apology needed—on account of the surprise expressed, by some of the shareholders in these companies, that their investments should have been so little affected by the rise and collapse of the latest American boom.

Shares on Offer

In the group of London Supply Companies, the would-be investor in the ordinary shares will find his choice severely limited by the difficulty of obtaining any. Five thousand County of London ordinary are offered at 53s. 9d., yielding £3 18s. 9d. per cent. One thousand St. James' & Pall Mall—commonly called "Jimmies"—are obtainable at 32s. 3d., to return £4 6s. 9d., and 500 "City Lights" at 34s. 3d. give £4 1s. 6d. per cent. on the money. Of North Metropolitan ordinary there are 500 in the market at 56s. 3d. These yield £4 1s. per cent. Greater scope prevails in the provincial list, but it must be admitted that the investor is offered a meagre return on his money from such shares (of which a few hundreds in each case can be purchased) as Clyde Valley, Electrical Distribution of Yorkshire, Midland Counties, Northampton and North Eastern. The yield from these, at the prices which a buyer is asked, comes to a few pence under 4 per cent. Southern Areas Electric Corporation ordinary at 25s. 6d. will return £4 6s. 3d. per cent. upon the basis of the dividend of 5½ per cent. which the board proposes to pay for 1933 provided, as it has said, nothing unforeseen occurs. The other calculations of yield given in this paragraph are worked out upon the full year's dividends last paid by the various companies.

In the further fields, East African Power & Light ordinary at 30s. 6d. cum dividend will return £4 11s. 9d., Jerusalem Electric & Public Service at 18s. 6d. will give £2 3s. 3d.—an increase in dividend is expected next year—Madras Electric Supply a tax-free 4¼ per cent. at 37s. 6d., and Kalgoorlie Electric Power & Lighting, at 10s. 9d., a yield of £5 11s. 6d. per cent. The last-named shares are of 10s. each, the rest being of £1 denomination.

Metropolitan Electric ordinary are better at 50s., and Electric Supply Corporation have strengthened further to 70s. Bournemouth & Poole at 73s. 9d., North Easterns at 31s., and Lancashires at 32s. 6d., are advanced. Edmundson's preference at 31s. have put on 1s., and Urban ordinary hold their previous good rise to 38s. 9d.

T.O.T.

Stocks and shares in the combine of Tube, Omnibus and Tramways attract attention chiefly on account of the interest taken in London Transport "C" stock. On the hint given here last week as to the relative values of this "C" stock and the Underground Railways £1 shares, the former fell 2½ points to 77 before it recovered. The shares, on the other hand, advanced to 25s. and retained the rise. As the other issues of the authority's stock are scarcely affected at all by such considerations, the prices hold their previous ground. What fluctuations occur in these will be governed by money market factors rather than by the earnings of the combine. The prices of three out of the five new stocks will be found added to our lists. Caution speaks of the "C" stock receiving 3 per cent. in the first year of working: hopefulness looks for 3½ per cent.: optimism rises to 5 per cent. The cessation of selling was followed by a rally to 79 in the price of the stock. Metropolitan consolidated is a point higher at 75.

Dollar Stocks

The main shock of the American slump occurred last Saturday, when the London Stock Exchange was closed. Wall Street prices came to men playing golf, tennis, cricket. On Monday and again on Tuesday in this week there was a rush to buy on the part of London. Prices rose materially above the worst. American Telephone & Telegraph stock was quoted about 128: recovery to 132½ left the price 7½ down on the week. International Telephone & Telegraph at 18 are 4 down. Brazilian Tractions at 15¾ show a drop of 1, but the price fell to 14 in the slump. Electric & Musical Industries, 16s. a week ago, touched 12s. 6d. before rallying to 14s. 9d. Other fluctuations ran on similar lines.

Cables and Wireless

The repercussion of the American excitement was severely felt in the market for cables and wireless stocks. The preference gave way to 80½, then picked up to 83¼, at which a point loss remains on the week's comparison. No net change has taken place in the "A" ordinary, but the "B" ordinary is lower at 14. Marconi Marines are down ¼ at 32s. 6d. The Anglo-American issues are very firm, and there are gains in both the preferred and deferred stocks.

Manufacturing and Miscellaneous

Callender's ordinary have been wanted, and at 65s. show ⅛ improvement. General Electrics and Associated Electrical Industries have followed, with mild fluctuations, the course of the American market. Both are easier on the week. British Aluminium recovered to 31s. 3d., after being lower. Siemens have receded to 22s. 6d. Telegraph Constructions moved up to 23s. 9d., to revert to their previous price of 22s. 6d.

The iron and steel group is quiet, its prices moving within narrow limits. Babcocks are 6d. down at 37s., and Vickers came on offer at 7s. Good features developed in the rubber share market, following upon a sharp rise—after an equally abrupt drop—in the price of the raw produce. Business in most of the Stock Exchange markets is running more quietly than of late, the change being largely due to the incidence of the hectic movements in Americans.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, July 25.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	73/9	+6d.	4 1 4
Brompton Ordinary	1	8½	7	32/6	—	4 6 2
Central Electricity 4½% Deb.	Stock	4½	4½	105	—	4 5 9
Charing Cross Ordinary	1	8½	7	33/0	—	4 4 10
Chelsea	1	8¾	7	32/-	—	4 7 6
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	37/6	—	3 14 8
County of London	1	10½	10½	53/9	—	3 18 1
Edmundson's 7% Pref.	1	7	7	31/-	+1/-	4 10 4
Elec. Dis. Yorkshire	1	9	9	45/-	—	4 0 0
Elec. Supply Corporation	1	11	11	70/-	+⅛	3 2 10
Kensington Ordinary	1	8	7	32/6	—	4 6 2
Lancs Light and Power	1	7	7	32/6	+6d.	4 6 2
London & Home Counties 4½%Deb.	Stock	4½	4½	107	—	4 4 1
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	50/-	+6d.	4 0 0
Midland Counties	1	7	7	37/6	—	3 14 8
Mid. Elec. Power	1	8	8	38/0	—	4 2 4
North Eastern Electric Ordinary	1	6	6	31/-	+1/-	3 17 5
Do. 7% Pref.	1	7	7	32/6	—	4 6 2
Northampton	1	10	10	50/9	—	3 18 9
Notting Hill 6% Pref.	10	6	6	13	—	4 12 4
North Met. Elec. 6% Pref.	1	6	6	29/-	—	4 2 9
St. James' and Pall Mall	1	8	7	31/6	—	4 9 0
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	7	33/-	—	4 4 10
Urban Ordinary	1	7	7	38/9	—	3 12 2
Westminster Ordinary	1	8½	7	32/-	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/9	—	7 4 7
Yorkshire Elec.	1	8	8	42/6	—	3 15 3
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	90	—	4 9 0
London Passenger Transport. C	Stock	Nil	Nil	79	—½	—
Do. do. 4½% A	„	Nil	Nil	113	—	3 19 8
Do. do. 5% B	„	Nil	Nil	116	+1	4 6 2
Metropolitan	„	2½	1½	75	+1	—
Underground Electric	1	7	4½	25/-	+6d.	—
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	132½	—7½	6 15 10
Anglo-Am. Tel. Pref.	Stock	6	6	107xd.	—	5 11 8
Do. Def.	„	1½	1½	27½	+1½	5 9 1
Cables & Wireless 5½% Pref.	„	2½	2½	83½	—1	3 5 10
Do. A 7½% Ord.	„	Nil	Nil	32	—	—
Do. B. Ord.	„	Nil	Nil	14	—1	—
Globe Tel. and T. Ord.	10	Nil	2½	12½	—	2 0 10
Do. do. Pre.	10	6	6	12	—	5 0 0
Great Northern Tel.	10	20	20	32½	—	6 3 0
Marconi-Marine	1	10	7½	32/6	—½	4 12 4
Oriental Telephone Ord.	1	12	12	2½	—	*4 3 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/9	—	—
Do. do. 2nd Pref.	5	Nil	Nil	4/6	—1/9	—
Do. do. 5% Deb.	Stock	Nil	Nil	12½	—2	—
British Electric Traction Df. Ord.	„	5	5	410	—	—
Do. do. Pref. Ord.	„	8	8	138	+3	5 16 0
Brazil Traction	100	—	—	15¾	—1	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	20/-	—	—
Mexico Trams, 5% Bonds	—	5	5	32½	—	15 7 8
Mexican Light Common	100	Nil	Nil	15½	—	—
Do. 7% Pref	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	70½	—	7 1 10
Victoria Falls Ord.	1	15	20	91/3	—	4 7 7
Yorkshire (West Riding)	1	Nil	Nil	11/-	+1	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	4	21/3	⅛	3 15 2
Do. Pref.	1	8	8	27/6	—9d.	5 16 5
Babcock & Wilcox	1	14	9	37/-	—6d.	4 17 3
British Aluminium Ord.	1	5	5	31/3	—	3 4 0
British Insulated Ord.	1	15	15	73/9	+1/9	4 1 4
Brush Ord.	Stock	Nil	Nil	35	—	—
Callender's	1	15	15	3½	+⅛	4 13 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/-	22½	—	18/3	—	6 5 7
Do. 8% Pref.	1	8	8	30/-	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	8/9	—3/9	—
Enfield Cable Ord.	1	25	25	4⅞	—	5 9 9
English Electric	1	Nil	Nil	11/3	—	—
Do. do. Pref.	1	Nil	Nil	15/-	+⅛	—
Ever Ready	5/-	35	35	29/3	—	5 19 8
Ferranti Pref.	1	7	7	24/9	+6d.	5 13 2
G.E.C. Pref.	1	6½	6½	29/0	—	4 9 8
Do. Ord.	1	8	8	42/6	—½	3 15 2
Henley's	1	30	30	6½	—	4 16 0
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/9	—	—
Johnson & Phillips	1	5	5	22/-	—	4 11 0
Siemens Ord.	1	7½	6½	24/6	—⅛	5 6 0
Telegraph Construction	£1	Nil	Nil	22/6	—	—

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings be taken.

1931

26693. "Electrical storage batteries." Drumm Battery Co., Ltd., and J. J. Drumm. September 24th, 1931. (394671.)
27537. "Wave filters." Siemens and Halske Akt.-Ges. October 4th, 1930. (Addition to 364561.) (394697.)
29429. "Systems of illumination employing electric non-filament gas tubes." A. C. Watson. October 23rd, 1931. (394718.)
29557. "Apparatus for controlling or modulating radiation, more particularly for the purposes of recording sound and for picture-telegraphy." C. Muller. October 24th, 1931. (394672.)
34912. "Windings for dynamo-electric machines." P. F. Stritzl. January 8th, 1932. (394719.)
34997. "Attachments for the mouthpieces of telephone transmitters." W. Godaert. December 20th, 1930. (394653.)
35600. "Electric switches for the control of luminous discharge tube installations." Healy-Davidson Corporation. December 26th, 1930. (394701.)
35980. "Voltage failure protection devices." Igranic Electric Co., Ltd., and S. R. Wright. December 30th, 1931. (394686.)
35995. "Telephone or like signalling systems." Electrical Research Products, Inc. January 30th, 1931. (394687.)

1932

80. "Control systems for electric motors driving sound and motion picture apparatus." Electrical Research Products, Inc. January 8th, 1931. (394707.)
89. "Electric melting of glass or the like." Hartford-Empire Co. February 5th, 1931. (394709.)
91. "Television apparatus." Marconi's Wireless Telegraph Co., Ltd., and D. L. Plaistowe, and H. M. Dowsett. January 1st, 1932. (394710.)
92. "Television and like facsimile signalling systems." Marconi's Wireless Telegraph Co., Ltd., and D. L. Plaistowe. January 1st, 1932. (394711.)
93. "Variable attenuation devices suitable for use in connection with thermionic amplifiers." Marconi's Wireless Telegraph Co., Ltd., and W. P. Wilson. January 1st, 1932. (394712.)
145. "Electrical attenuation networks." Marconi's Wireless Telegraph Co., Ltd., H. V. Griffiths and W. P. Wilson. January 2nd, 1932. (394715.)
425. "Reflecting galvanometers." British Thomson-Houston Co., Ltd., and S. R. Eade. January 6th, 1932. (394724.)
437. "High tension magneto-electric machines." F. Stickland. January 6th, 1932. (394725.)
693. "Illuminated signs." L. E. R. Murray and A. C. Cordell. January 9th, 1932. (394728.)
1504. "Illuminated indicating or mimic diagrams." A. N. Haworth and Associated Electrical Industries, Ltd. January 18th, 1932. (394735.)
1776. "Electric motors." British Thomson-Houston Co., Ltd., and A. F. Heinrich. January 20th, 1932. (394738.)
2235. "Electric circuit-breakers having arc-rupturing devices." Westinghouse Electric and Manufacturing Co. January 26th, 1931. (Addition to 388175.) (394740.)
2243. "Oil-blast electric circuit breakers." International General Electric Co., Inc. January 23rd, 1931. (394741.)
2749. "Electric motors." British Thomson-Houston Co., Ltd., and W. McConnachie. January 29th, 1932. (394742.)
3362. "Electric hand lamps." G. Usmar. February 4th, 1932. (Cognate application 10944/32.) (394744.)
4284. "Synchronous electric timekeeping devices." Hammond Clock Co. February 13th, 1931. (394751.)
4873. "Electric hand lamps." R. D. Boyce. February 18th, 1932. (394755.)
4874. "Electric welding apparatus." British Thomson-Houston Co., Ltd., and A. A. Pollock. February 18th, 1932. (394756.)
5436. "Electric spot-welding machines." J. A. Dorrat and Associated Electrical Industries, Ltd. February 23rd, 1932. (394758.)
7698. "Indicators for use in mimic circuits or like diagrams." International General Electric Co., Inc. March 16th, 1931. (394768.)
8325. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and D. P. Long, and W. G. Patterson. March 21st, 1932. (394772.)
8395. "Electric arc-welding machines." L. Miller and Associated Electrical Industries Ltd. March 21st, 1932. (394773.)
8807. "Automatic telephone and like selective systems." Siemens Bros. & Co., Ltd., W. G. Patterson, and D. P. Long. March 24th, 1932. (394775.)
9515. "Dielectric materials." British Thomson-Houston Co., Ltd. April 2nd, 1931. (394776.)
10133. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. April 8th, 1932. (394780.)
10961. "Electrically-operated clocks." V. J. S. Russell. April 16th, 1932. (394784.)
11057. "Telegraph exchange system." Siemens and Halske Akt.-Ges. April 18th, 1931. (394785.)
11428. "Electric secret contact combination switches for the protection of movable and immovable objects. E. Baron and H. A. Newman. April 21st, 1932. (394789.)
14444. "Electric insulators." Electric Transmission, Ltd., and E. N. R. Cox. May 21st, 1932. (394798.)
15044. "Electric secondary cells and method for their production." Dunlop Rubber Co., Ltd., E. W. Madge. May 27th, 1932. (394803.)
15651. "Combined aerial switch and lightning arrestor." A. F. Bulgin and A. F. Bulgin & Co., Ltd. June 2nd, 1932. (394805.)
18065. "Terminal board or block for electricity meters." Landis & &Gyr Akt.-Ges. (394814.)
18158. "Ultra-short wave radio and like receivers." Telefunken Ges. für Drahtlose Telegraphie and P. Hermannspann. June 27th, 1932. (394815.)
20908. "Light sensitive cell circuits particularly for use in photographic sound reproduction." Radio Corporation of America. August 7th, 1931. (394822.)
21431. "Device for exploring or reconstituting an object or image for use in systems of picture telegraphy, copying telegraphs or television or the like." E. Wotton. July 29th, 1932. (Cognate application 22617/32.) (394824.)
21690. "Transformers." International General Electric Co., Inc. August 1st, 1931. (394825.)
22059. "Dielectric for electric apparatus." British Thomson-Houston Co., Ltd. August 6th, 1931. (394828.)
24469. "Electric water heater." A. R. Townsend & C. H. Fulham. September 3rd, 1931. (394836.
25985. "Short-time electric switches especially for lighting staircases at night." R. Bertele. September 19th, 1931. (394842.)
26355. "Machines for casting storage-battery grids." R. O. Watkins. June 20th, 1932. (394844.)
27064. "Vacuum electric switches." International General Electric Co., Inc. September 29th, 1931. (394847.)
27667. "Electrically-heated flow water heater." Calotherm Ges. April 19th, 1932. (394849.)
27848. "Protective means for electric apparatus." International General Electric Co., Inc. October 6th, 1931. (394850.)
28058. "Extensible electric conductor." K. Herkenberg. October 8th, 1932. (Patent of addition not granted.) (394851.)
28294. "Adjustable supports for electric lamps." R. H. Graham & W. N. Horsley. October 11th, 1932. (394854.)
29023. "Electro-dynamic speakers." Rola Co. June 2nd, 1932. (394857.)
29862. "Luminous electric discharge tubes." General Electric Co., Ltd. December 14th, 1931. (394861.)
30089. "Electric generators for the ignition systems of internal-combustion engines." R. Bosch Akt-Ges. November 28th, 1931. (394862.)
30158. "Synchronous electric motor." Landis & Gyr Akt-Ges. August 19th, 1932. (394863.)
32853. "Electric cooking or boiling apparatus." C. E. Cutting. September 27th, 1932. (394873.)
33458. "Vacuum-arc apparatus." Akt-Ges. Brown, Boveri et Cie. November 25th, 1931. (394875.)
35208. "Television telecinematograph and like systems." Telefunken Ges. für Drahtlose Telegraphie. December 12th, 1931. (394883.)

1933

216. "Electric multicore cables." Cablon, Ltd. January 5th, 1932. (394891.)
1703. "Method of, and apparatus for, electrically precipitating suspended particles from a gas." Lodge-Cottrell, Ltd. (Research Corporation of New York.) January 18th, 1933. (394899.)
4935. "Means for securing electrical contact blades in position." G. Gavoret et Cie. April 7th, 1932. (394919.)
5063. "Multi-contact electric tumbler switches." G. Gavoret et Cie. April 8th, 1932. (394920.)
5515. "Containers for oil-immersed electrical apparatus." English Electric Co., Ltd., A. T. Chadwick & T. A. Long. February 23rd, 1933. (394924.)
6929. "Means for regulating by transformers the distribution of wattless and load currents in ring mains." International General Electric Co., Inc. March 7th, 1932. (394934.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 19th:—

Trubicle. No. 537464. Class 8. Fitted electrical switchboards.—Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester.

Fame (lettering and design). No. 538717. Class 8. Radio receiving sets and parts thereof, and battery eliminators for use with radio receiving sets.—E. K. Cole, Ltd., Priory Crescent, Southend-on-Sea.

Targex. No. 539528. Class 8. Electrically illuminated advertising signs.—Herbert Pearce, 13, Porchester Square, W.2.

Alpha, No. 539603, and **Lamda,** No. 531495. Class 8. Thermionic valves.—High Vacuum Valve Co., Ltd., 113-117, Farringdon Road, E.C.1.

Cadet. No. 540500. Class 8. Sound recording, reproducing, and transmitting apparatus, radio-telegraphic, telephonic, and television apparatus, radio-gramophones, and parts thereof, &c.—Columbia Graphophone Co., Ltd., 102-108, Clerkenwell Road, E.C.1.

Drummer. No. 541734. Class 8. Radio-telephonic receiving sets.—William Edge & Sons, Ltd., 50, Raphael Street, Bolton, Lancs.

Sunic, Watson, London (lettering and design). No. 541044. Class 11. Instruments, apparatus and contrivances (not medicated) for surgical or curative purposes, &c.—Watson & Sons (Electro-Medical), Ltd., 43-47, Parker Street, Kingsway, W.C.2.

Circ. No. 540581. Class 13. Electric water immersion heaters.—Santon, Ltd., Lloyd Street, Somerton, Newport, Mon.

Beeantee. No. 539038. Class 13. Electric lampholders and junction pieces, all being metal goods.—Beeantee Illumination. Ltd., 70, Banner Street, E.C.1.

Bupar. No. 541876. Class 13. Electric switches (ordinary).—Dewhurst & Partner, Ltd., Inverness Road, Hounslow.

Blendex. No. 542056. Class 13. Anti-dazzle electric lamps for motor vehicles.—Elisabeth Sanzenbacher and Rosa Rommer, Zurich. (British representative: Henry Fairbrother, 30-32, Ludgate Hill, E.C.4.)

Albrico. No. 540648. All goods in Class 15.—Allbright Electric Co., Ltd., 2-5, Dingley Place, City Road, E.C.1.

Osira. No. 541390. All goods in Class 15. No. 541391. Class 18. Heating and cooking stoves, radiators for heating, and lighting installations.—General Electric Co., Ltd., Kingsway, W.C.2.

Chef-Co. No. 541864. Class 18. Electric cooking stoves.—W. De Roemer, 20, Arthur Road, Wimbledon Park, S.W.19.

Miscanlite. No. 541064. Class 50. Cases for electric battery lamps and other articles.—Grosvenor Electric Batteries, Ltd., 2-3, White Street, Moorgate, E.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Houses (50); U.D.C. surveyor.

Ashby-de-la-Zouch.—Additions to school buildings (£6,500) for the Governors of Girls' Grammar School; G. Fowler, architect, County Education Offices, Greyfriars, Leicester.

Ayr.—Houses (72), Lochside; burgh surveyor. Extensions, St. Margaret's High Grade School (electrical and heating work); W. Reid, architect, 14, Wellington Square.

Barnsley.—Houses (95); borough surveyor.

Bedford.—School (940 places), London Road Housing Estate, for Borough E.C.; H. Darlow, clerk.

Bedlington.—Houses (80); J. W. Pooley, U.D.C. surveyor.

Bexhill-on-Sea.—Offices, &c., London Road; D. L. & A. E. Lewis.

Birmingham.—Houses, Mount Road; G. Featherstone, 22, Booth Street, Handsworth. Flats, Russel Road, Moseley, for the Ideal Benefit Society, 177, Corporation Street (£70,000); R. O. Warder, architect, Harrison Road, Erdington. Factory premises, Brearley Street, Newtown, with electrical installation (£15,000); A. J. Archer, architect, 11, Waterloo Street. Mental hospital, Marston Green (£85,205), and technical college buildings (£400,000); city engineer. School, Audley Street (£12,844), for E.C. School, Bristol Road; governors, King Edward's Foundation. Additions to Birmingham Bicycle Works, Cleveland Street (£4,000), with electrical work; C. Twigg, architect, 7, Theodore Street, Aston. Additions, for C. Clifford & Son, Stirchley (£10,000), with electrical installation; Harrison & Cox, architects, 109, Colmore Row. Additions to factory, Kent Street, for Southall Bros., Ltd., Charford Mills, Saltley (£10,000), with electrical installation; Martin, Martin & Ward, architects, 106, Colmore Row. Extensions to Peacock's Stores, Bull Ring (£10,000), with electrical work; C. E. Fillmore, chartered architect, 8, Newhall Street.

Blaydon-on-Tyne.—Houses (30), Winlaton; T. Mastaglio, surveyor, Council Offices.

Bournemouth.—Schools, Kinson and East Howe, for E.C. Additions to St. Christopher's School, Wimborne Road; Miss D. J. L. Widlake.

Bradford.—Extensions to Swain House and Woodroyd Schools; city architect.

Braintree.—Masonic Temple, Bradford Street, Bocking (£10,000); A. G. Wicks & Sons.

Bridlington (YORKS).—New tailoring premises, Princess Street, for Montague Burton, Ltd.; company's architects' department, Hudson Road, Roundhay, Leeds.

Brownhills (STAFFS).—Houses (50), Walsall Wood; N. Waine, clerk.

Bury (LANCS).—Houses (164); J. Chadwick, borough engineer.

Carluke.—Shops and dance hall, Stewart Street, for M. Burns.

Carmunnock (GLASGOW).—Shops, J. Crawford Boyd, Stewarton, Ayr.

Cheadle (STAFFS).—Houses, 90, Uttoxeter Road, Forsbrook, for A. Lilley.

Chesterfield.—R.C. Church, Staveley (£7,000); priest-in-charge, St. Joseph's. Offices, New Beetwell Lane, for the Chesterfield and Bolsover Water Board (£4,000), with electrical installations; Houfton & Kington, architects, Furnival Chambers, Market Place.

Coulsdon (SURREY).—Houses (20), Reddown Road; E. B. Clarke.

Croydon.—Extensions, May Day Hospital, Thornton Heath (£16,800); H. Berney, architect, 33, High Street.

Cumberland.—Additions to the Whitehaven Secondary School (£6,337), and Workington Technical and Secondary School (£13,647); T. Armstrong, Ltd., builders, Cockermouth.

Didcot.—Houses (20); F. H. Floyd, architect, St. Nicholas House, West Mills, Newbury.

Dudley.—Houses (20), Buffery Estate; Poole Bros.

East Lothian.—Additions and alterations, Tranent Public School (£5,000); county clerk, Haddington.

Esher.—Houses (64); U.D.C. surveyor.

Glasgow.—Additions to branch bank premises, 464, Victoria Road, for the Bank of Scotland, 2, St. Vincent Place; Balfour & Stewart, architects, 110, Blythswood Street.

Gorleston.—Houses (120), Middleton Road (£52,400); H. A. Holmes & Sons, Ltd.

Guildford.—Alterations, &c., Theatre Royal (£10,000); proprietor.

Halifax.—Alterations to Stoney Royd Transport Depôt (electrical installation); D. T. Lloyd Jones, borough engineer, Crossley Street.

Hamilton.—Houses (70); Edward Morgan & Co., builders. Estate development, Chantinghall, for Lanarkshire Building Society; A. Kyle, manager, 3, Avon Street.

Hemel Hempstead.—Houses (150); borough surveyor.

Hertfordshire.—Two elementary schools, Russell Lane and Ossidge Estate; county surveyor.

Hinckley (LEICESTERSHIRE).—Premises, Edward Street, for the Co-operative Society, Ltd., Castle Hill; H. Crump, architect, Barclays Bank Chambers, The Borough.

Hitchin.—Institution extensions (£27,617); L. & W. Whitehead, Ltd., Clapham.

Huddersfield.—Cinema, for a local syndicate; J. H. Freer, architect.

Inverness.—Public baths; burgh surveyor.

Lancashire.—Infants' school, Fiddlers Lane, Higher Irlam, for County E.C. Extensions to Wolstenholme Hall Asylum; county architect.

Leamington.—Extensions, Eagle Foundry, Clarence Street, for S. Flavel & Co., Ltd.

Leekbrook (STAFFS).—Houses (376), Spicer Stone Estate, for Longden & Venables.

Lincoln.—Hotel (£7,000), for Mowbray & Co., Ltd., Monks Road.

Liverpool.—Houses, Dovecot Estate (215) and Huyton Farm Estate (87); director of housing, Municipal Annexe, Dale Street. Extensions, David Lewis Northern Hospital, Great Howard Street (£50,000).

London.—(ACTON).—Houses (64), Noel Road, for Great Western Garden Village Society; T. Alwyn Lloyd, architect, 6, Cathedral Road, Cardiff. Engineering works, Gunnersbury Lane; H. Bailey, architect, 73, Queen Victoria Street, E.C.4. Factories, various sites; F. E. Simpkins, architect, Park Royal Road, N.W.10. Works extensions, Victoria Road; R. H. Radburn, architect, Broadway Chambers, W.3. Swimming bath, East Acton Lane; borough engineer. (CAMBERWELL).—Operating theatre, poor law hospital (£2,923); W. H. Gaze & Sons, Ltd. (CHELSEA).—Houses, Whiteheads Grove; W. Kaula, 22, Southampton Street, W.C.1. (DULWICH).—Tenements, East Dulwich Estate (£121,000); L.C.C. architect. (EALING).—Houses (30), Bridgewater Road; Houselands, Ltd., 47, Victoria Street, S.W.1. Houses (42), Rosedene Avenue; Ruddock & Meighan, Bedford House, Harrow View, Wealdstone. Houses (294), Manor Farm Estate; C. R. W. Chapman, Council Offices, High Road, Wembley. Cinema, Ruislip Road; J. W. Bateson, architect, 46, Bedford Road, W.C. Additions, Hanwell Hospital Dodge & Reid, architects, 120, High Street, Brentford. (FULHAM).—Additions, Hope Laundry, Aspenlea Road; P. Pratt. (HONOR OAK).—Dwellings, rehousing estate (£59,620); L.C.C. architect. (KENSINGTON).—Laboratory, St. Mary Abbots Hospital (£2,487); Triggs & Co., Ltd. Extensions, St. Charles Hospital (£4,401); John B. Sharman, Ltd. (LAMBETH).—Hospital alterations (£8,179); H. & J. Taylor. (LEWISHAM).—Bath and library; borough engineer. (TOTTENHAM).—Factory alterations, Fawley Road; Albion Sewing Cotton Co. Factory, Percival Court; F. Berndes, Ltd. Factory extensions, Hermitage Road; British Woodcrafts, Ltd. Laundry extensions, 258, St. Ann's Road; Oceana Laundry Co.

Longridge.—Extensions and new premises for the Co-operative Society, Ltd., Berry Lane; builders, exors. of W. Almond, Preston Road.

Lutterworth.—Houses (26); R.D.C. surveyor.

Mansfield.—Houses (124), Ravensdale Estate; borough surveyor.

Newcastle-on-Tyne.—Houses (276), Elswick Road and Armstrong Road; C. S. Errington, architect, 21, Grainger Street West.

Newport (I.O.W.).—Offices and workshops, Westfield, for Southern Vectis Omnibus Co.

Nottinghamshire.—School, Ollerton (£6,307); Harper & Green, Ltd., builders, Carlton.

Oldham.—Houses (30), Pretoria Street,, Cash Gate Street, and Collier Hill Avenue; Squire Ashton & Sons, Ltd., builders, Cheapside.

Paddock Wood (KENT).—Extensions to canning factory (£20,000); manager.

Paignton.—Houses (76), Blatchcombe Road; L. J. Boyce, Ltd.

Perth.—Remodelling Municipal Buildings (£12,000); T. McLaren, burgh surveyor.

Purley.—Cinema, High Street; F. C. Mitchell.

Rochdale.—High School for Girls, Greenhill (£30,000); R. & T. Howarth, Ltd., builders, Crossfield Works.

Royston.—Institution extensions (£3,542); John Ray, Ltd., Letchworth.

Salendine Nook (YORKS).—Cinema; J. Ainley, architect, 25, Market Street, Huddersfield.

Salford.—Shops and hall at the corner of Regent Street and West Howard Street (£6,000); building department, Pendleton Industrlial Co-operative Society.

Sedgley.—Houses, Upper Gornal Estate; U.D.C. surveyor.

Sheffield.—Branch stores, Milton Road, for the Worksop Co-operative Society, Ltd., Eastgate; M. Haslam & Son, architects, Ryton Chambers, Bridge Street, Worksop.

Sidmouth.—Catholic church (£8,000); J. E. Walter, architect, Park Side Chambers, Paignton.

Solihull (WARWICKSHIRE).—Shops, High Street, for Atkinson & Market; Harford, Kingham & Nock, architects, 3, Waterloo Street, Birmingham.

Southend-on-Sea.—Houses (122), Leigh Estate; borough engineer.

Surrey.—Boys' secondary school, Bushey Mead, Merton; technical college extensions, Kingston-on-Thames; and school, Tolworth (£13,250), for County E.C.; F. Mee, deputy secretary, Kingston-on-Thames.

Swansea.—Aerodrome; Norman, Munt & Dawbarn, of Heston Airport.

Tipton.—Houses (228), Ocker Hill Housing Estate; H. N. Woodward, surveyor, Council Offices, Owen Street.

Trowbridge.—Extensions to the District Hospital; W. W. Snailum, architect.

Twickenham.—Houses (104), Redway Estate; H. M. Grellier & Son, Palace Chambers, S.W.1.

Tynemouth.—School, Cullercoats, for E.C.

Uttoxeter.—Houses (125); S. S. Proud, U.D.C. surveyor.

Wallasey.—Branch library, New Brighton, for Corporation Sub-Committee.

Ware.—Institution extensions (£25,313); Anglo-Scottish Construction Co., Ltd.

Watford.—School, Leggatts Way (£28,336); London Construction Co.

Weardale (DURHAM).—Houses (50); W. C. Leech, builder, Coutts Road, Newcastle-on-Tyne.

West Sussex.—Extensions to Midhurst Institution (£15,000); clerk, Chichester.

Whickham-on-Tyne.—Houses (49), Broom Lane; U.D.C. surveyor.

Willenhall (STAFFS).—Fire station and offices, Old Hall site (£14,700); U.D.C. surveyor.